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MONTHLY

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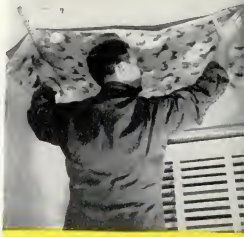

HOW TO PAPER A ROOM

PAGE 161

25¢ May, 1951

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by Wilbur Shaw

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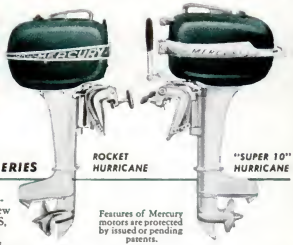

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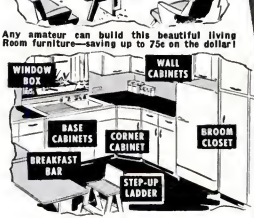

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POPULAR SCIENCE Monthly

Mechanics and Handicraft

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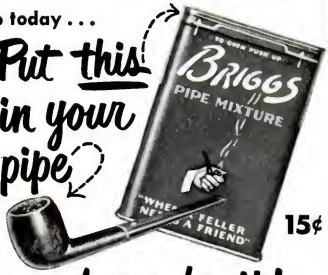

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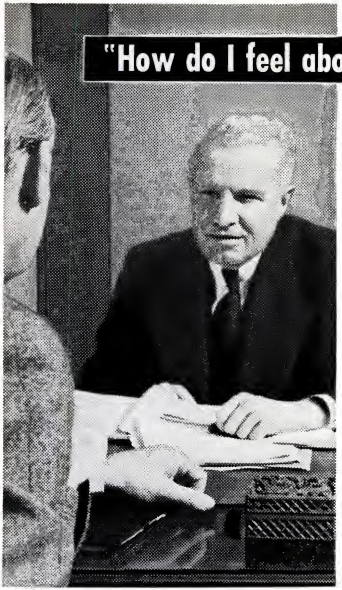
Highballing With a Camera

The pictures and adventures of an expert photographer of railroad trains will be one of the many features of next month's POPULAR SCIENCE. Don't miss it.



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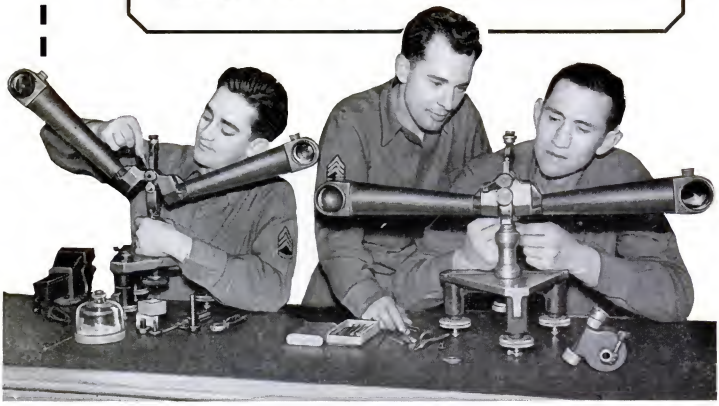

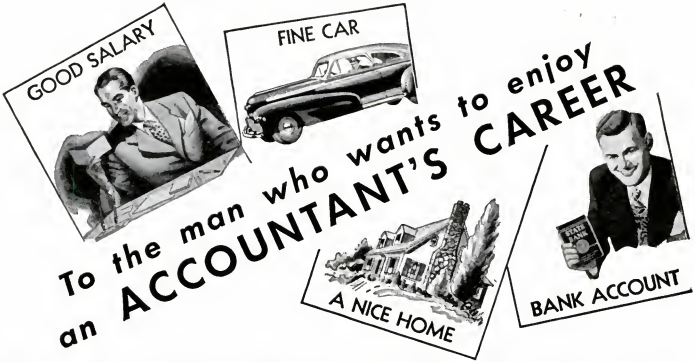

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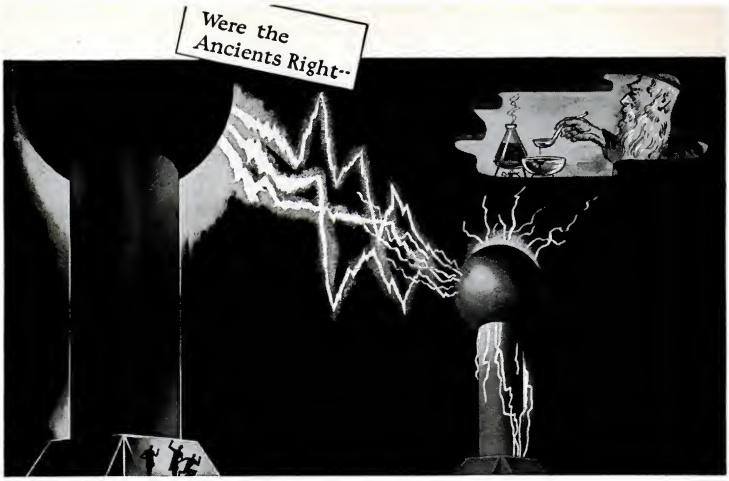

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Will Nature's last frontier give way to man's inquiring mind? Can man become a creator, peopling the world with creatures of his own fancy? Was the ancient sage right, who said: "To the Gods the Soul belongs, but to man will belong the power of Life"? Will the future know a superior, Godlike race of humans—each a genius and each the masterful creation of an unerring formula—or will Soulless beings, shorn of the feelings which have bound mortals together in understanding, dominate the earth?

For centuries, man has dared to invade realms which theology has declared sacred. He has revealed the secret of organic functions and measured the forces of mind—*now,* breathlessly, he tears at the veil which conceals the nature of life itself. Will this be his crowning achievement—or his utter annihilation?

It is one of the greatest controversies of the day. Orthodox religion pronounces it a diabolical experiment—some schools of science declare it *possible* and *justifiable.*

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The Rosicrucians, San Jose, Calif.

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Address_____

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The ROSICRUCIANS

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Men in 10 cities—nationwide—compared New 1951 Schick Injector Blades with whatever they had been using. About 80% of the men had a preference. Of these, the votes were in the ratios shown above.

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SCHICK INJECTOR RAZOR & BLADES

World's Only Razor with Automatic Blade Changer

Letters

Reader Adds Own Tools

Sir:

I wonder if any home handyman agrees with the Government experts' list of the 36 basic tools a householder should have as given in your January 1951 number.

It seems to me that the most serious omissions were:

1. Hand drill and drills
2. Vise
3. Faucet seat dresser
4. Try square

To keep the list at 36, four of the following could be omitted, which although sometimes useful, are not used enough to make them considered basic: drawknife, gimlet, glass cutter, framing square, bucket, wash tub, funnel.

1. I use my hand drill more than any other tool except hammer, screwdriver, and pliers. The single gimlet listed is no feasible substitute.

2. A vise is surely a basic tool. If a bench vise is not convenient, a small vise that can be clamped to table or chair will serve most purposes.

3. Many faucets that need new washers have their seats roughened or nicked and unless smoothed will soon ruin the washer. Although seat dressers with several cutters can be purchased, many plumbers prefer to make their own out of a round emery sharpener for carving knives. They say they work better than the boughten kind. I have both kinds and use the cutter first and then the emery. To make the dresser, break the emery away from the center of the knife sharpener and cut the exposed center wire. This makes two dressers of different size which can be rotated by the hand drill.

4. A try square is more often used than a framing square.

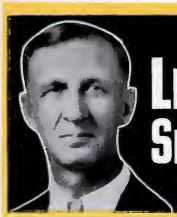
H. M. Morley

Hollywood, Cal.

Rear-Door Lock

Sir:

I'm sure you will find our American car designers are as concerned about our children's safety as are the British. We don't need to *copy* the rear-door safety device of



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by Practicing in Spare Time

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MAIL COUPON

NEW

I TRAINED THESE MEN

"After graduating, worked for servicing shop. Now Chief Engineer of three Police Radio Stations."—S. W. DINWIDDIE, Jacksonville, Illinois.

"While learning, made $5 to $10 a week in spare time. Now have a profitable spare time shop."—L. ARNOLD, Pontiac, Mich.

"I accepted a position as Radio and Television Technician . . . was promoted to manager of Television Service and Installation."—L. HAUGER, San Bruno, California.

"Have my own shop. Am authorized serviceman for five manufacturers and do servicing for 7 dealers."—P. MILLER, Maumee, O.

"When I enrolled, had no idea it would be so easy to learn. Have equipped my shop out of spare time earnings. I am clearing about $40 to $60 a month."—J. D. KNIGHT, Denison, Tex.

"Four years ago, a bookkeeper on a hand-to-mouth salary, am now a Radio Engineer ABC network."—N. H. WARD, Ridgefield Park, New Jersey.

I Will Train You at Home with MANY KITS OF PARTS I SEND

Do you want good pay, a job with a bright future and security? Would you like a profitable shop of your own? The fast growing, prosperous RADIO-TELEVISION industry is making these opportunities for you. Radio alone is bigger than ever. 90 million home and auto Radios, 3100 Broadcasting Stations, expanding use of Aviation and Police Radio, Micro-Wave Relay, Two-Way Radio for buses, taxis, etc., are making opportunities for Servicing and Communications Technicians and FCC-Licensed Operators.

Television is TODAY'S Good Job Maker

In 1946 only 6,000 TV sets sold. In 1950 over 5,000,000. By 1954, 25,000,000 TV sets will be in use, according to estimates. Over 100 TV Stations are operating in 35 states. Authorities predict there will be 1,000 TV Stations. This means new jobs, more jobs, good pay for qualified men.

Many Soon Make $10 A Week Extra in Spare Time

Keep your job while training at home. Hundreds I've trained are successful RADIO-TELEVISION TECHNICIANS. Learn Radio-Television principles from illustrated lessons. Get PRACTICAL EXPERIENCE experimenting with circuits common to Radio and Television. Many students make $5, $10 a week extra fixing neighbors' Radios in spare time. Special Booklets start teaching you the day you enroll.

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To stop oil-pumping, replace worn engine connecting rod bearings

A rubber band and a wad of paper can start real trouble—and so can worn engine bearings! Worn connecting rod and main bearings in your car engine mean disappointing performance—sluggish pick-up in traffic... lack of power on the road. *Worn engine bearings cause oil pumping!* You can't expect new piston rings to correct oil pumping when it starts at the bearings. Give new rings a chance to do their own job—replace worn engine bearings, too. Ask for genuine Federal-Mogul bearings—your mechanic knows they're *engineered* for the job of oil control!

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CONTROL OIL-PUMPING
WHERE IT STARTS—REPLACE WITH

FEDERAL-MOGUL

OIL CONTROL BEARINGS

the Jaguar—we have had it for some time.

For example: To quote from the Chevrolet Shop Manual, "On the rear doors of sedans the door lock incorporates a means of shifting the remote-control link lever to provide free-wheeling or positive action on the remote control handles at the option of the owner."

ROBERT E. WILENSKY
Savannah, Ga.

Yes, but the change takes tools, time, and patience and, once made, is more or less permanent. You can't change quickly and easily from one to the other the way you can with the Jaguar's push-button arrangement.

TV Chimney Sweeps?

Sir:

In "The Best Ways to Mount TV Antennas" (Jan. '51, p. 169) you say: "Chimneys are convenient things to put antennas on." It's been my experience that the smoke and soot from a chimney collects on the antenna in the form of carbon. Carbon acts as a resistance on both the antenna and its connections and weakens reception. . . .

MERLE W. WYNN
Pittsfield, Mass.

Moisture and other chemicals in the air cause corrosion that worries TV installers even more. However, Mr. Wynn is correct in stating that soot is a problem. Carl Quirk, technical chief of Du Mont's Teleset Service division reports:

"Certain precautions should be observed in making chimney installations, particularly in weak-signal areas. If soot and grime are deposited at the point where the transmission line joins the antenna, it is possible that signal strength may be reduced because of poor electrical contact. This can be prevented by coating the contacts with a rubber-base sealer. Wherever possible the contact strip should be turned so it is not directly over the chimney opening.

"It's also a good idea to clean the contacts in the spring."

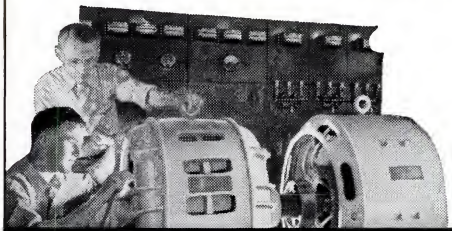
Oversize Bore

Sir:

On page 196 of the February issue, the illustration on the engine number that is followed by a dash to indicate .010" oversize cylinders and pistons appears to me to be a

THESE MEN ARE GETTING PRACTICAL TRAINING IN ELECTRICITY

On Real:



A.C. and D.C. MOTORS
GENERATORS
SWITCHBOARDS
CONTROLLERS
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APPLIANCES
ELECTRONIC UNITS

(Shown at left—Instructor explaining operation and testing of a large Motor Generator in our A.C. Department.)

AND TELEVISION-RADIO

On Real:

TELEVISION SETS
RADIO RECEIVERS
F.M.
(Frequency Modulation)
RECORD CHANGERS
AUTO RADIOS
PUBLIC ADDRESS Systems

(Right—Instructor helping students check the wiring and trace circuits of television receivers.)

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ANOTHER FIRST... FOR RENAULT '51

Renault de-luxe stock sedan captures first place in International Grand Prix.

Motorists the world over, know the gruelling hazards of the International Grand Prix held annually over a closed course including every type of road, at Le Mans, France. Driving continuously for 24 hours, two non-professionals brought the Renault '51 de-luxe four passenger stock sedan first across the finish line to achieve a magnificent victory in the 1100 C. C. class.

This new Renault '51 is the only foreign car built especially for American roads. Before it was placed in production in Europe's largest automotive works, at Billancourt, France, it was tested and re-tested by crews of engineers over every kind of American road —and at every temperature from Maine's 20° below to Imperial Valley's 120° above zero.

With the engine in the rear (where it should be) this newest Renault travels 45-50 miles to the gallon. Only two quarts of oil fills the crankcase. Roll-down windows and improved wind deflectors provide ample no-draft ventilation. Its carburetor has been improved. Monocoque welded steel body construction provides greater safety and eliminates squeaks and rattles, while independent four wheel springing makes even the longest drive a pleasure.

Get behind the wheel of the new Renault '51 sedan and you will soon see why it won the International Grand Prix! An authorized Renault dealer near you —with factory service and ample spare parts . . . is waiting to give you the ride of your life in the Renault '51!

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Buick. Whether or not this is so, I think you will find the practice limited to very few motor manufacturers, both as to the uniform .010" oversize and as to the dash.

LEE F. BERNHARDT

Fort Wayne, Ind.

The practice of finishing bores oversize is widespread throughout the auto industry, but you're right in that the amount and method of marking may vary with different manufacturers. The car PS pictured was a Buick.

Sounds Fishy, but True

Sir:

In the February issue of POPULAR SCIENCE (p. 170) you offered the suggestion of floating a board on the water in an aquarium to keep from disturbing the plants when new water is added. We feel there is an oversight made in your article. The board should be well cured in water for at least three months before using. New wood is definitely poison to tropical fish. Wood may be artificially cured in a few days by slaking a large piece of lime in water and soaking the board in it for five days. Rinse well and the board is ready for use.

TRABERT'S AQUARIUM

Columbus, Ohio

Uncured wood might prove harmful if left in the tank for a long time, but if removed immediately after filling could not possibly hurt the fish. Plywood, however, should definitely not be used.

Reader Saves Money

Sir:

May I compliment you on your book? I recently saved $10 erecting my television aerial through your instructions ["The Best Ways to Mount TV Antennas," PS, Jan. '51, p. 169].

EVERET J. WATAHA

Linden, N. J.

Next month PS will tell you how to build a television booster.

Car Used, So Is Advice

Sir:

I am a regular reader of POPULAR SCIENCE because it gives me many helpful ideas. The

INVENTORS

Learn how to protect your invention. The U. S. Patent Laws provide that any new and useful art, machine, article of manufacture, or composition of matter, or any new and useful improvement thereof, may be patented if the act of invention is involved. Therefore, every inventor with a valuable invention should take advantage of the Patent Laws and proceed for patent protection in order to safeguard his rights.

A patent gives the inventor the exclusive right to prevent others from making, using, or selling the invention claimed in the patent for a period of seventeen years.

The Patent Laws were enacted for the benefit of the inventor to give him protection for the features of his invention which are patentable. These features must be properly and concisely set forth and claimed in a formal application for patent, in order to comply with the requirements of the Patent Laws. For that reason, unless the inventor is familiar with patent matters, he should engage a competent registered patent attorney or agent to represent him. We are registered to practice before the U. S. Patent Office and are prepared to serve you in the handling of your patent matters.

A specially prepared booklet entitled "Patent Guide for the Inventor", containing detailed information with respect to patent protection and procedure, together with a "Record of Invention" form will be promptly forwarded to you without obligation upon request.

CLARENCE A. O'BRIEN & HARVEY JACOBSON

Registered Patent Attorneys

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Send me free leaflets on Weldwood Glue, Firzite and Satinlac.

NAME_____

ADDRESS_____

main reason why I am sending you this letter is to ask you to reprint a very helpful suggestion which you printed in your April edition in 1950. It was, "How to Buy a Used Car," and it was the most important thing in buying my secondhand car. With your advice I got my money's worth dollar for dollar, instead of a lemon.

Right now many of my friends are asking me for the magazine but I lost it somewhere, so if you would be kind enough to reprint it, my friends will be overjoyed.

R. C. Jackson

Trenton, N. J.

The article is available at most libraries, or a copy of the issue in which it was published can be obtained from the Popular Science Circulation Department.

A Warning on Sodium Valves

Sir:

Your February 1951 issue contains an article titled "Homemade Tools from Old Auto Valves" (page 193).

Under "Hole Saw" the author suggests using a valve from an airplane or boat. If someone were to get a valve from an airplane engine, he might get a sodium-filled exhaust valve, and according to instructions I received while in our Army Air Force during the last war, cutting into these valves is extremely hazardous, due to the sodium contained in them.

Wm. Hatfield

Jersey City, N. J.

PS should have cautioned readers against cutting into sodium-cooled valves, which are widely used in aircraft engines, and to a lesser but increasing extent in large truck engines. Such valves, usually identifiable by an "S" stamped on the top, contain pure sodium that ignites on contact with air. The stem should not be sawed, and cracked sodium valves should be buried for safety.

Keeps Tabs on PS

Sir:

On each issue of my Popular Science, I paste a tab on which I note articles I might want to refer to later . . . You'd be surprised how often I refer to these tabs for certain information.

Sam E. Patterson

Norfolk, Va.

INVENTORS

If you believe that you have an invention, you should find out how to protect it. The first step is to have a search made of the prior pertinent U. S. patents. If a report on this search indicates that the invention appears patentable you can apply for a patent, and the specifications and claims should be prepared.

The firm of McMorrow, Berman & Davidson, with offices in Washington, D. C., is qualified to take the necessary steps for you. We can make a preliminary search on your invention, advise you whether we think it can be patented, and prepare your application for patent.

Unless you are fully familiar with the U. S. Patent Laws, we recommend that you engage the services of a Registered Patent Attorney to protect your interests. The patent laws are *your* laws. A patent gives you the right to prevent others from making, using or selling the invention claimed in your patent for a period of 17 years.

Use these patent laws for your protection. Investigate whether your invention can be patented. If you have what you believe to be an invention, we suggest that you have this firm make a search for you.

Send for a copy of our Patent Booklet entitled "How To Protect Your Invention," containing information about patent protection and patent procedure. Along with this we will also send you an "Invention Record" form, for your use in writing down and sketching details of your invention. We will mail them promptly. No obligation. They are yours for the asking.

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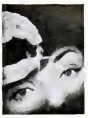

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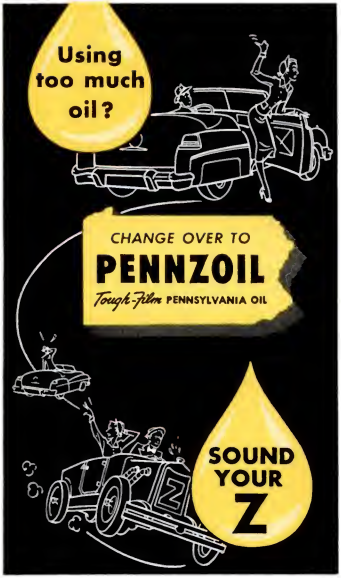
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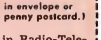

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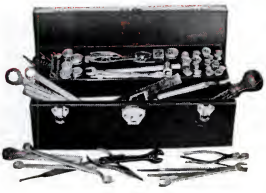

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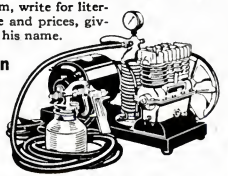

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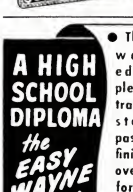

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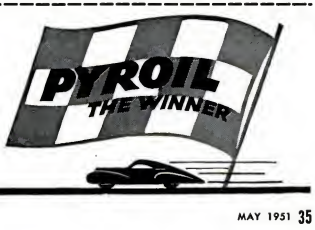

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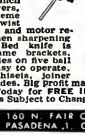

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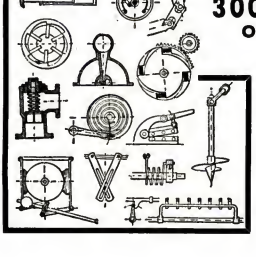

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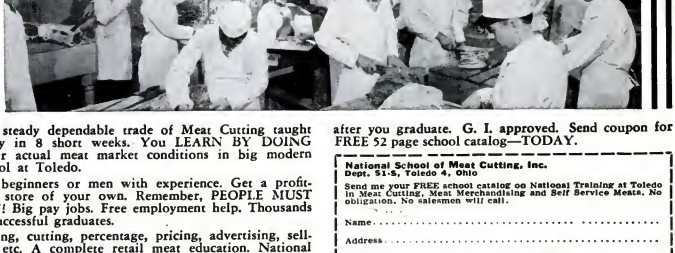

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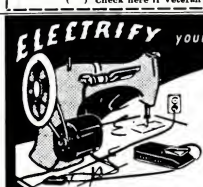

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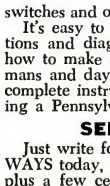

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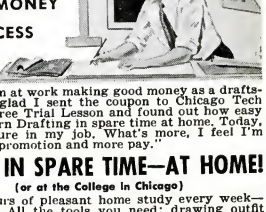

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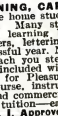

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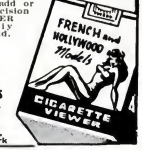

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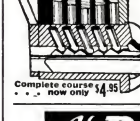

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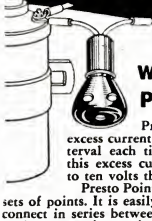

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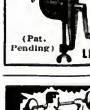

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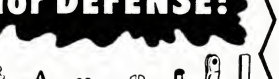

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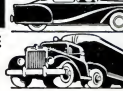

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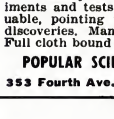

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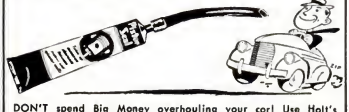

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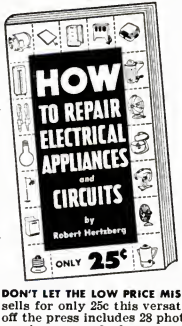

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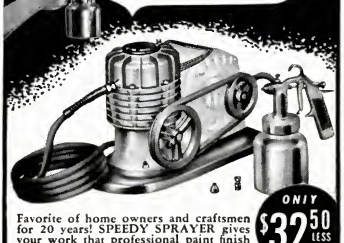

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5.000 DIFFERENT Stamps—$12.50. Lists free. Beacon Sales, Maynard 3, Mass.

U.S. 797 SPA Sheet only 5c to applicants for U. S. approvals. M. Haycock, 235 66th St., Brooklyn, N. Y.

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42 HOBBIES, COLLECTIONS

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50 DIFFERENT army embroidered patches $1. Other bargains. Insignia Mart, 703B Broadway, N. Y. C. 3.

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46 MINERALS & PRECIOUS STONES

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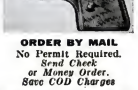

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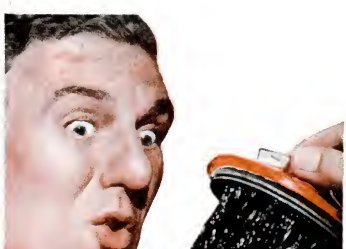

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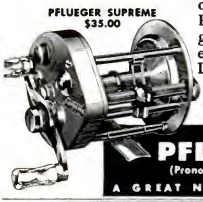

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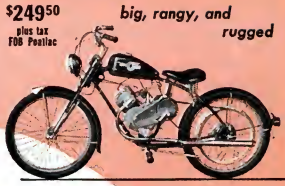

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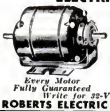

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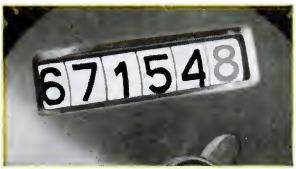

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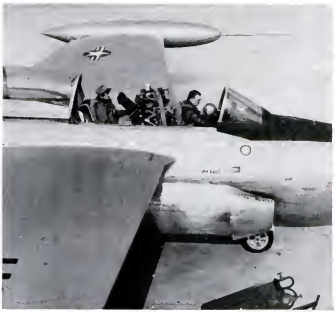
BETTER THINGS FOR BETTER LIVING . . . *THROUGH CHEMISTRY*

Popular Science *Highlights* This Month

House that Auto Surplus Built: The materials for this unusual home came from surplus stock of an automobile factory. **Page 130**

The Right Way to Climb a Ladder: The first rule is to make balance and leverage work for you—not against you. **Page 170**

Pint-Size Racers Thrill Track Fans: These "three-quarter midgets" put an exciting show smack in the crowd's lap. **Page 110**



Meet the 700-m.p.h. Scorpion: The Air Force is putting its money on this all-weather F-89 jet to defend continental U. S. **Page 143**

Concrete Can Be Colorful: New dyes, stains, and paints make it easier to take the drabness out of your slab floors. **Page 197**

POPULAR SCIENCE
MECHANICS AND HANDICRAFT

How Good Are the "Little Cars"?

the Austin: refinements

By Wilbur Shaw
PS PHOTOS BY W. W. MORRIS

They're easy on the pocketbook, but just how much car do you get for the lower price? Here Shaw puts three "little cars" through their paces and gives you the answers.

REPORT FROM THE

DRIVER'S SEAT . . .

RISING prices and bigger tax bites out of the American pocketbook are making "little" cars look more attractive these days to a lot of buyers.

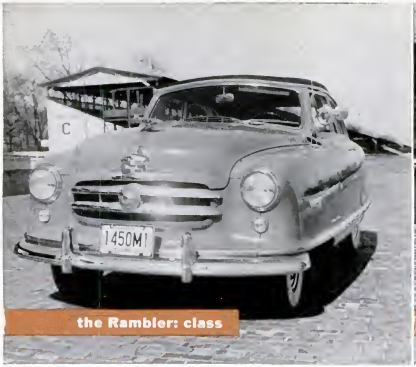
They're priced lower. They use a lot less gas. They go farther on a set of tires. They're easier to park and maneuver. They're ideal for daily shopping. Most of them are simpler than the big cars and therefore easier and less costly to keep in repair.

So let's take a ride in three of these short-wheelbase jobs on the Indianapolis Motor Speedway and see how they perform.

Only two small cars—distinguishable from midget cars—are now made in this country. When the war ended, two of the "big three" manufacturers were fiddling with plans for producing little cars. But they never reached the market.

The two small U. S.-made cars that have finally made their appearance were brought out within the last 18 months by manufacturers who hope to annex a bigger share of the market for their products. One is Kaiser-Frazer's Henry J. The other is the Nash Rambler. The first is a sedan, the second a convertible. Nash also makes a Rambler station wagon.

We sped the three little cars around the track together, led by the Austin and followed by the Rambler and the Henry J in that order. The cars are on the Speedway's northwest turn. The Austin is chugging to keep ahead. Driving the Rambler is Tommy Milton, the famous rac-



the Rambler: class

the Henry J: low cost

These cars aren't the first small jobs ever made in the U. S. My memory goes back to a lot of little cars of yesteryear—the Ambler, the Scripps-Booth, the Arrow Cyclecar, the Brush, the Saxon, and the Monroe among them.

But they weren't really small cars in those days. They'd be considered small today only because the average car is a lot heavier, longer, wider, and roomier than its ancestors.

For comparison, in driving the two latter-day revivals of the American small car, I chose a British-made Austin—which is not small by British standards. I chose it because the Austin is the most popular foreign car sold in this country.

This is the start of the playback of my tape-recorded comments on the Austin:

You don't have to jackknife yourself into the front seat of this car. There's entrance room and headroom. The over-all height is greater than in the Henry J and the Rambler. That may affect its roll in a turn . . . we'll see.

The pull-type starter switch on the dash . . . may confuse the beginner in this job . . . the starting motor makes too much racket . . .

Foot Pedals Confusing

Wups! I'm confusing the brake with the clutch pedal. The positioning of the two on the floor is bad . . . first gear is really low . . . first gear on the Austin is the reverse gear on our cars . . . this little engine races its heart out in first . . . the transmission is pretty noisy in the first three gears.

The two long straightaways and four turns on the speedway gave me a chance to see what the car would do upwind, downwind, and crosswind, though the wind was fairly light.

I do get some roll on the turns . . . as I anticipated . . . despite the fact that the track is banked . . . and there's some windwander in a crosswind . . . she doesn't want to keep her wheels straight . . . there's also some pitching on the bricks.

The brick-surfaced portion of the speedway in front of the main grandstands, a part of the original track that is kept for

ing driver who now is track steward. POPULAR SCIENCE's Devon Francis and Bill Morris, photographer, are in the Austin and Henry J.

sentimental reasons, is fairly rough. The pitching, of course, was due to the short wheelbase.

I was curious as to what the Austin would do with the accelerator on the floorboard as a key to the best cruising speed. But first, I decided to see how fast that 40-horse engine would take the Austin to an indicated 60 miles an hour. A couple of times around the 2½-mile track on the stopwatch established a speedometer error of two miles an hour on the high side at an indicated 60.

I tried slow shifting and fast shifting on the acceleration, using all four forward gears, and the best I could do for 60 indicated was 34 seconds. That was pretty slow—on this side of the Atlantic. Then I opened her up. She edged up to 71 and stopped.

U. S. Standards Different

In running my eye back over what I've said about the Austin, I find that it doesn't actually reflect my opinion of the car. The Austin is a good car. It's just hard to evaluate by U. S. standards. In England, it's a pretty good-looking automobile. Over here, it's dumpy, almost dowdy, ranged alongside our cars.

Yet, it's sturdy. It has a solid feel, like a bigger car. Its sheet metal is of a heavier gauge than that in most U. S. cars. It has little refinements—like a center armrest in the rear seat and foam-rubber cushions—unknown to low-priced U. S. cars. Its great virtue—high gas mileage—comes right from its great fault (by our standards)—a tiny, low-horsepower engine.

I climbed from the Austin into the Henry J, the only U. S. car not in the midget class that can compete with the Austin in price. The Henry J I had chosen to drive was the four-cylinder. Kaiser also makes an 80-hp. six under this name. It was a stripped-down—not a de luxe—version.

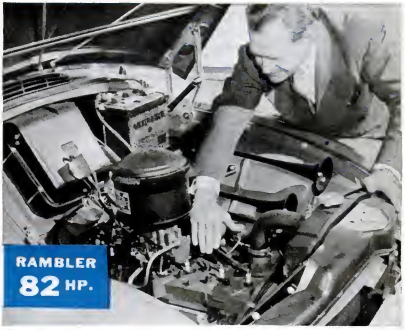
You Get What You Pay For

Let's not kid ourselves about low-priced cars . . . you get what you pay for, and no more. I'd say this is America's austerity car . . . and with the times what they are . . . we may need a lot of this kind of vehicle.

I'm bothered by the shift lever . . . it's hard to get it into neutral by feel.

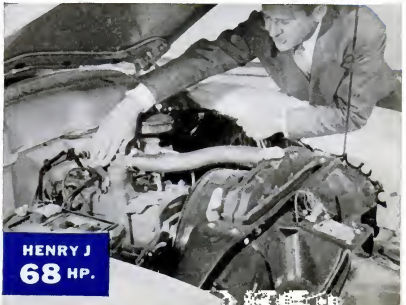
I had been equally bothered by the Austin lever because it was mounted on the transmission box, as it was years ago in

I looked over all three engines. The 40-hp. Austin's probably lacks the oomph demanded by the bulk of U. S. motorists. Yet I felt that this car offered most for the invested dollar.



The Rambler has big-car zip and luxury. Its engine gives it a weight per horsepower of only 29.6 pounds, compared with 33.8 for the 4-cylinder Henry J and 56.2 for the Austin.

The Henry J has zip too, but it needs a silencer for its air cleaner. The engine is so short that a shroud is put around the fan to direct the air backward for proper cooling.



Facts on the Austin

Make and model: Austin A40 four-door sedan.

Engine: 4-cyl. valve-in-head; 40 hp. at 4,300 r.p.m.; car weight per hp. 56.2 lb.; bore and stroke, 2.578" by 3.5"; compression ratio, 7.2:1; piston displacement, 73.17 cu.in.

Engine piston travel: (in feet per car mile)—2,290.

Crankshaft bearing surface: 12.407 sq. in.

Torque: 59 lb.-ft. at 2,200 r.p.m.

Transmission: 4-speed manual shift.

Rear-axle ratio: 5.14:1.

Steering ratio: 14:1.

Radius of turning circle: 19 ft.

Effective brake-lining area: 72.5 sq.in.

Springs: front, coil; rear, semi-elliptic.

Weight and outside dimensions: 2,250 lb. (approx.); height, no load, 63¾"; over-all length with bumpers and guards, 153¾"; width, 61"; wheelbase, 92½"; front overhang, 26"; rear, 35"; tread, front, 48½"; rear, 49½".

Inside dimensions: seat-cushion width, front, (two independently adjustable seats) 21" each; rear, 45½"; leg room, front, 41"; rear, 31"; headroom, front, 36¾"; rear, 34½"; seat height, front, 13½"; rear, 14½"; vertical distance, steering wheel to seat cushion, with seat in mid-position, 6½"; front-seat adjustment, horizontal, 7¼".

Tire size: 5.25 by 16; optional replacement, 5.50 by 16.

Facts on the Rambler

Make and model: Nash Rambler two-door convertible.

Engine: 6-cyl. L-head; 82 hp. at 3,800 r.p.m.; car weight per hp., 29.6 lb.; bore and stroke, 3⅜" by 3¾"; compression ratio, 7.25:1; piston displacement, 172.6 cu.in.

Engine piston travel: (in feet per car mile)—1,860 without overdrive.

Crankshaft bearing surface: 14.28 sq.in.

Torque. 138 lb.-ft. at 1,600 r.p.m.

Transmission: 3-speed manual shift with optional overdrive.

Rear-axle ratio: 3.778 without overdrive, 4.375 with overdrive.

Steering ratio: 20.4:1.

Radius of turning circle: 18' 7".

Effective brake-lining area: 92.1 sq.in.

Springs: front, coil; rear, semi-elliptic.

Weight and outside dimensions: 2,430 lb. (approx.); height, no load, 59½"; over-all length with bumpers and guards, 176"; width, 73½"; wheelbase, 100"; front overhang, 31 5/32"; rear, 44 11/32"; tread, front, 53¼"; rear, 53".

Inside dimensions: seat-cushion width, front, 59"; rear, 45¼"; leg room, front, 42¾"; rear, 37"; headroom, front, 35"; rear, 35¾"; seat height, front, 11½"; rear, 13½"; vertical distance, steering wheel to seat cushion, with seat in mid-position, 6"; front-seat adjustment, horizontal, 4"; vertical, ⅝".

Tire size: 5.90 by 15.

Facts on the Henry J

Make and model: Henry J two-door sedan.

Engine: 4-cyl. L-head; 68 hp. at 4,000 r.p.m.; car weight per hp,, 33.8 lb.; bore and stroke, 3¼" by 4⅜"; compression ratio, 7:1; piston displacement, 134.2 cu.in.

Engine piston travel: (in feet per car mile)—2,620.

Crankshaft bearing surface: 11.697 sq. in. projected.

Torque: 109 lb.-ft. at 1,800 r.p.m.

Transmission: 3-speed manual shift.

Rear-axle ratio: 4.1:1.

Steering ratio: 18.2:1.

Radius of turning circle: 17' 6".

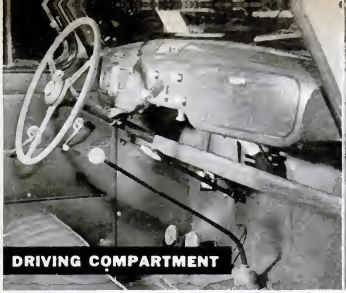
Effective brake-lining area: 132 sq.in.

Springs: front, coil; rear, semi-elliptic.

Weight and outside dimensions: 2,304 lb.; height, no load, 59⅝"; over-all length with bumpers and guards, 174½"; width, 70"; wheelbase, 100"; front overhang, 35 11/32"; rear, 39 5/32"; tread (indentical in front and rear), 54".

Inside dimensions: seating width (door to door), front, 58"; rear, 56¾"; leg room, front, 42.32"; rear, 35.6"; headroom, front, 35.76"; rear, 35.92"; seat height, front, 11.92"; rear, 10.92"; vertical distance, steering wheel to seat cushion, with seat in mid-position, 6.8"; front-seat adjustment, horizontal, 7"; vertical, 1.5".

Tire size: 5.90 by 15.



For its size, the Austin had a surprising amount of room in it. Controls are not as well centered as in American cars. That shelf under the panel is for small packages.

The Rambler has everything—radio, heater, electric clock, and directional signals. And it should have—for the price. Of the three little cars, the Henry J costs the least.

Devon Francis tried out the driver's entrance room in all three cars, with the adjustable seat full forward. The Austin's proved to be the best—more than 42 inches high by 26 wide.

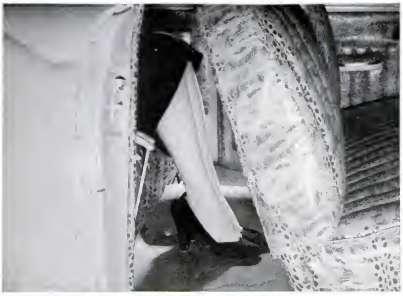
You have to duck your head to get into the Rambler. Entrance room is only 39 by 23½. All three cars have a gas economy of about 35 m.p.g., the U. S. cars when using overdrive.

With the seats still full forward, we measured back-seat leg room with a model 5 feet, 8 inches tall. They turned out to be approximately the same—between 4 and 5 inches.

At the left is the Austin's, above is the Rambler's, at the right is the Henry J's. With the front seats full back, the model's knees had no spare room in any of the three vehicles.

The Henry J's front compartment was the most spacious of the three. This photo is of the stripped-down, low-cost job. The pictures directly below are of the de luxe version.

The Henry J's entrance room was a bit better than the Rambler's—40¾ by 27. Both had the disadvantage found in all two-door sedans—a tight squeeze getting into the back seat.



All three cars' rear seats take only two persons comfortably. Inside the Henry J's door jamb you will see a rod used to lock the back of the rear seat down for added luggage room.

American cars, instead of on the steering column.

I get very little roll on the turns . . . remarkably little pitch on the bricks, too . . . but there is no solid feel . . . I don't get any feeling of solidity in this car . . . it feels light, which of course it is . . . yet it seems to behave in the wind.

That was hard to believe because the car felt so light under me. So I made several more crosswind runs to make sure. The results were the same. I got no tendency to wind-wander.

This engine is rough . . . all fours are relatively rough . . . so was the Austin's. Your vibration level goes up as your cylinder count goes down.

A calibration showed the speedometer to be four miles off on the high side at an indicated 60, as nearly as I could judge from a jiggling needle. The speedometer reached that reading in an average of 18 seconds in four tries. The car had plenty of seat for its horsepower.

That same jiggling needle gave me an indicated top speed of between 82 and 84 miles an hour. But the vibration was so pronounced that the rear vision mirror offered only a shaky image of the track behind me.

I would say that the brakes are good . . . there is no tendency to fade in a stop from high speed . . . they're better than the Austin's . . . the Austin's were too soft. The vision from this car is well-nigh perfect . . . there's plenty of glass area.

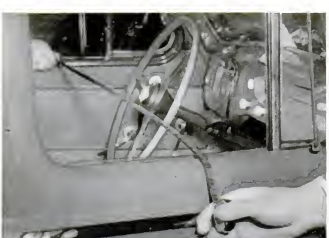
The Henry J proved to be about what I had anticipated, no more, no less. The Henry J's chief virtue is inexpensive transportation and roominess. It *will* hold five people. More than four can't ride comfortably in either the Austin or the Rambler.

My last mount was the little Nash convertible. It belongs in the class of the Henry J and the Austin only as to size. It's *not* an inexpensive automobile. While it's the cheapest U. S. convertible, there's nothing cheap about it. It costs several hundred dollars more than either the Austin or the Henry J.

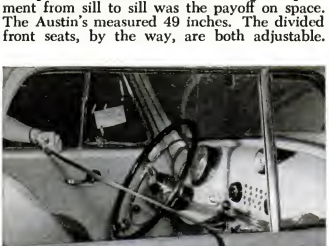
I've put more than 500 miles on one of these . . . and it's a surprise . . . it was a surprise package from the start. It's got scat . . . it has lines . . . it's pretty.

The reason for its performance is obvious—it has 82 horsepower in six cylinders for only 2,400 pounds of car.

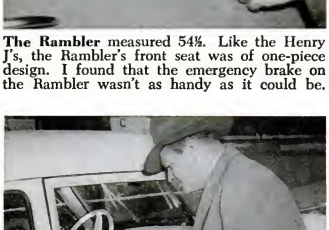
She gets away . . . gets right away . . .



A tape measure across the driving compartment from sill to sill was the payoff on space. The Austin's measured 49 inches. The divided front seats, by the way, are both adjustable.



The Rambler measured 54½. Like the Henry J's, the Rambler's front seat was of one-piece design. I found that the emergency brake on the Rambler wasn't as handy as it could be.



The Henry J's was 57 inches. This car comes in both 4- and 6-cylinder versions, with window vents, deck lid, special upholstery, armrests, and a vacuum-boost fuel pump as extras.

I'm on a turn at 65, with no roll . . . there's not the slightest tendency toward roll . . . that's on account of the fabric top and low center of gravity . . .

There's no wind-wander . . . there's no pitch . . . well, perhaps a trifle, on this short wheelbase . . . but nothing to bother you . . . it rides good.

The speedometer was on the button with the Austin's—an error of two miles an hour at 60. With the overdrive locked out, Devon Francis, of the POPULAR SCIENCE editorial staff, clocked me on acceleration. We indicated 60 in 21 seconds. That was slower than I had thought it would be.

There's a decided drop-off in acceleration after 65. She's going on up . . . against a headwind . . . to 74.

Runs with and against a brisk wind that suddenly had sprung up on the speedway gave me an average of 79 miles an hour. The one I drove earlier this year was faster than this one. The rear-axle ratio is 4.375:1 with overdrive.

All This and Lights, Too

You can dive into a turn with this job without getting any tire squeal . . . that's about the best recommendation I know of . . . that's a good indication of the handling qualities and the stability of a chassis . . .

You can't have everything, though. The fabric in the top flutters . . . it does make quite a noise when you get up speed. The brakes I would rate as excellent compared with good for the Henry J and soft for the Austin. The Rambler and Henry J have something else on the Austin, too . . . these lights . . . there are red lights on your panel . . . in both cars . . . to flash you signals when your oil is low or your battery is on discharge . . .

This car is as solid as a rock . . . it feels good . . . the noise level is low . . . so is the vibration level. My only real quarrel is with the rear vision . . . a fault of all convertibles. An outside rear-vision mirror on the Rambler is a must.

In aesthetics, ride, and interior appointments, the Rambler, obviously, was the class of the three little cars. It was also priced at the top, by a considerable margin. It had the convertible's traditional drawback of little or no protection for the passengers in a roll-over accident, though permanent side rails holding the top gave it more rigidity than other convertibles [PS, May '50, p. 110].

Little cars don't have much luggage space. Rambler's (center) was the smallest, Austin's (right) the best designed. Low-priced Henry J's (left) is reached from inside the car.

This is a sample of the quality built into the Austin—foam rubber in the seats. This car has pleasant little gimmicks such as a chain on the gas-tank cap so you can't lose it.

This picture was shot through the back of a de luxe Henry J, which has a rear-opening trunk lid. Back of rear seat is locked down. This model has a divided front seat and special trim.

As for a choice among them, the buyer has to ask himself what he wants in an automobile—a high cruising speed, luxury, looks, price, trade-in value, economy, ease of handling, or a combination of only some of these and perhaps other factors?

With prices at the gas pumps on the rise, does he actually want better mileage at a sacrifice of room, or would he rather get his economy by cutting down on his driving and own a full-sized car? If he wants economy, any one of these three little cars—together with a number of other little European cars on the U. S. market—most certainly will give it to him. He can get up to 25 to 35 miles to the gallon.

Cars, like meat, sell by the pound. Manufacturers are always trying to reduce their cost-per-pound of car. The cost-per-pound of little cars is considerably beyond that of big cars. For what value it may have in deciding *your* choice of a little car, here are the costs-per-pound of the three cars I drove. They are figured on the basis of New York salesroom prices in mid-March, 1951, including the Federal tax but not a sales tax:

Austin—69½ cents.
Rambler—80½ cents.
Henry J—59 cents. **END**

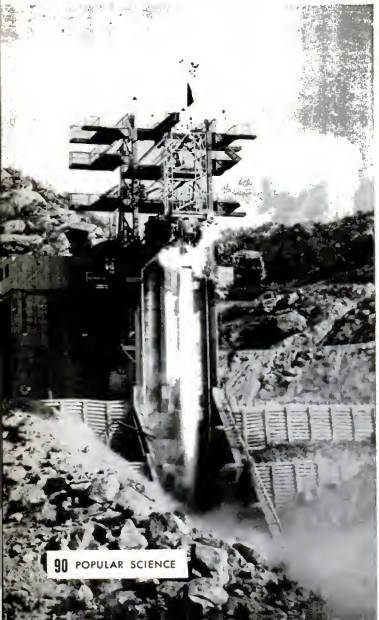
This Month's Shaw-ism

The man who always beats the light deserves a nice funeral.

Kilton Stewart

50-Foot Radio Telescope to Study Static from the Stars

WHAT looks like a gigantic chafing dish on top of the building above is a new 600-inch "radio telescope" at the Naval Research Laboratory in Washington. At right, workmen lower into place the last of 32 aluminum sections forming a concave reflector that will focus radio waves from the heavens onto an antenna in the center. Installed on a five-inch-gun mount, the reflector can be rotated a full circle and aimed vertically from below the horizon to beyond the zenith. The 75-ton instrument will extend scientists' observations of radiation from the sun, moon, and stars. Their findings, besides enlarging man's knowledge of the universe, are expected to be useful in long-range weather forecasting and in predicting solar disturbances that interfere with radio communication.



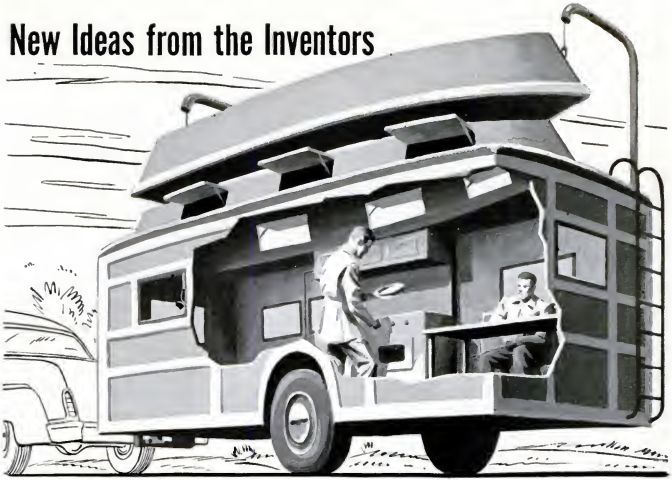
Rocket Power Tested in Stand

SPEWING flame like a giant blowtorch, the powerful rocket engine at left would fly faster than sound if released. But North American Aviation engineers keep it tied to this stand in the mountains of southern California while instruments measure its power. Platforms atop the stand are used to install fuel and pressure lines, and water jets below prevent fires during guided-missile tests for the Air Force.

Catapult to Hurl Jet Aloft

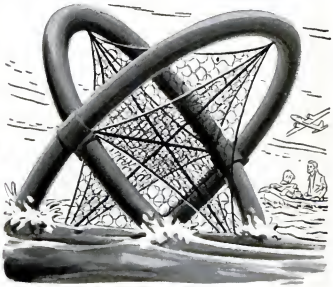
TO SAVE precious seconds in heading off enemy planes detected on a radar screen, the Navy's new, batlike XF4D interceptor, below, is designed to be catapulted from a carrier deck. Expected to climb rapidly to a height of eight miles, the Douglas-built tailless jet craft has completed high-altitude test flights.

New Ideas from the Inventors



1 Trailer to Carry Boat on Roof. Designed for use by traveling sportsmen, this car trailer makes it easy to take a rowboat along on trips. The boat fits neatly over a raised section in the center of the roof, which in turn provides additional headroom inside the trailer. A pair of davits, which can be raised when needed, makes it simple to lift the boat off the roof and lower it for use at the destination.

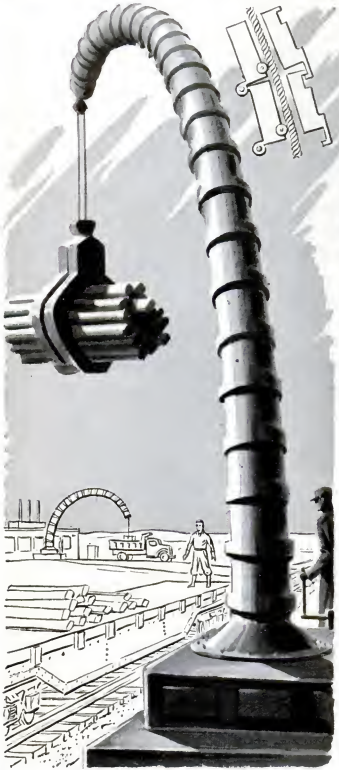
2 Rotary Hammer to Break Up Paving. Old road surfaces that are to be repaved could be broken up quickly with this device. It consists of a rotary hammer that can be mounted on a tractor and driven by the tractor's power take-off. The hammer has a series of pivoted arms that flail the paving as they rotate.

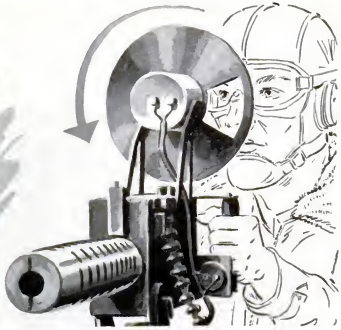


3 Radar Target to Float. This collapsible radar reflector for guiding searchers to downed fliers is supported by two circular, tubular frames that inflate automatically when the buoy hits the water. The water closes an electrical circuit to fire a powder charge that drives release pins into two gas cartridges for inflation.

Turn the page, please, for three more new ideas.

MORE New Ideas from the Inventors



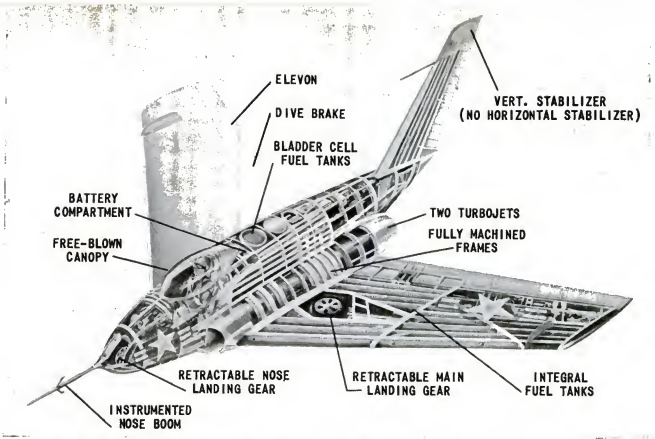


4 Sight to Aid Gunners. Looking through this whirling stroboscopic disk, a gunner sees his tracer stream only as short dashes at intervals of known range. So instead of trying to aim the entire stream, he simply aims the dash nearest to the target plane. When the plane comes into that particular range, it flies right into the bullets' path.

5 Hoist to Have "Gooseneck" Boom. Operating on the same principle used in many jointed toy animals, this hoist has a flexible boom controlled by a central cable. With the cable pulled taut, the boom assumes a vertical position. As the cable is payed out, the boom curves down until the full limit of its ringlike hinges is reached. The internal cable is then used as hoist.

6 License to Be Part of Car. The license plate developed by this inventor is translucent with opaque numbers and is permanently installed to form an actual part of the trunk compartment. Lighted from within, the plate would be clearly visible, practically theftproof, and difficult to falsify. It would be kept up to date by installing a new insert each year.

Patents on these inventions have been granted to: 1. R. Kuns, Cincinnati; 2. A. Putnam, Chicago; 3. E. Hudspeth, Cambridge, and J. Nash, Boston; 4. E. Baker, Merced, Calif.; 5. H. Drake, U. S. Navy; 6. O. Gropper, Woodside, N. Y.



Tiny X-4 Sonic Research Plane Is Packed with Gear

HERE'S a peek at the tightly crammed interior of the Northrop X-4, one of the Air Force's flying laboratories. For the past two years AF pilots have been flying the jet research plane at Edwards Air Force Base, Calif., delving into the mysteries of sonic flight. One of the smallest planes ever built for the Air Force, the X-4 measures only 25 feet from wing tip to wing tip, 20 feet from nose to tail. Elevons in the trailing edge of the swept-back wing double as ailerons and elevators.

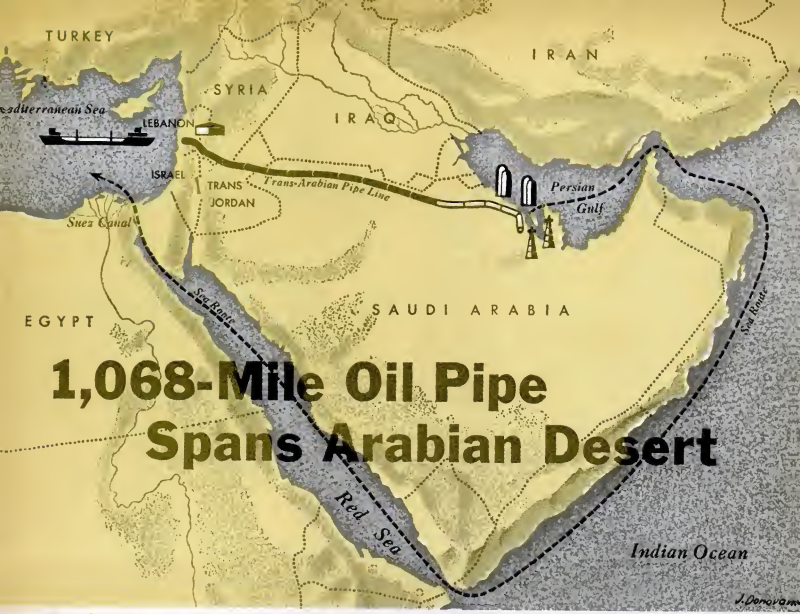
Plastic Suit Stops Radioactive Dust

INTENDED for use in radiologically contaminated areas, this plastic suit will keep out water and dust particles as fine as 1/50,000 of an inch in diameter. Suit and boots are made of vinyl, with an acetate window. A mechanical filter protects the lungs, and rubber gloves allow finger movements. Lockheed designed it for the Navy.

Navy Develops Cold-Weather Boot

THE new boot, left below, is rubber inside and out. Sandwiched between is a layer of wool insulation, seen along sole in cutaway, center. Worn with only one pair of medium wool-cotton socks, this construction prevents excessive perspiration that sometimes caused frostbite with the old-style shoepac, right, that required one or two pairs of heavy wool socks for insulation.

1,068-Mile Oil Pipe Spans Arabian Desert



World's largest pipeline eliminates 3,200-mile tanker trip once needed to ship Arabian oil to Europe. Pipeline delivers 300,000 barrels a day—enough to run all cars in New York state.

American engineers built the world's largest pipeline to carry oil across desert country that even the camels avoid.

OIL men call it Tapline. To build it, in the face of colossal difficulties, took 1,600 Americans, 15,000 Arabs, $225,000,000, and 270,000 tons of steel—hauled half way around the world from California.

Now this 1,068-mile pipe across the blazing Arabian desert is delivering 300,000 barrels of oil a day from rich fields on the Persian Gulf to the eastern shore of the Mediterranean. To carry as much by the old 3,200-mile sea route through the Suez Canal would keep 62 large tankships busy steadily.

Tapline (which includes two sections: a distribution network owned by Arabian-American Oil Co. and a main line owned by Trans-Arabian Pipeline Co.) runs from Bahrein, in Saudi Arabia, to Sidon, in Lebanon. From there tankers take the oil to U.S.-owned refineries in Europe. Construction was done by International Bechtel, Inc., and Williams Brothers Corp.

Flow of Arabian oil, vital to European defense, cannot be stopped now by bombing of Suez Canal. But pipeline itself is vulnerable, being located in Middle East not far from Russia.

In the middle of the vast desert, welders join together the long sections of pipe that make up Tapline. Pipeline extends 1,068 miles across varied types of terrain—almost all bad.

Arab workers operate machine that pulls length of 30-in. pipe from inside one of 31-in. size. Pipe was made in two sizes and shipped nested at a saving of $3,000,000 for cargo space.

To save work in the field, 31-ft. sections of pipe were welded (below) into 93-ft. lengths at Persian Gulf and Mediterranean ports, then hauled across desert. [*Continued on next page.*]

"Skyhook" carries 9 tons of pipe ashore in Saudi Arabia from artificial unloading island built 2½ miles at sea in Persian Gulf because of shallow water and lack of docks.

Tank trucks load up with fresh water at one of 40 wells drilled along pipeline route to supply construction crews. Man-made oases have become centers of new Bedouin settlements.

Heavy anchors hold the pipeline at point where it makes 13° bend. This section is part of Arabian-American Oil Co.'s distribution network, which feeds main line of Trans-Arabian Pipeline Co. The whole system, stretching from Persian Gulf to Mediterranean, is called Tapline.

At line's terminus on Mediterranean, tankers tie up at four loading berths, spaced 2,600 feet apart, and are fed by submarine pipes running a mile out to deep-water anchorage.

Special machines wrap and lay huge pipe (below). At right, Arab adjusts one of big valves controlling oil flow. Some weigh 11 tons each.

Greenhouse Plants Grown and Transplanted in Plastic Bags

Bags of Vinylite plastic film hold the rose plants at right, growing in a greenhouse during the off season. Bag and all, they are transplanted in summer to the outdoors and later in the year are taken in before killing frosts.

The plastic bags replace bulky and breakable pots for planting seedlings and seed, in a system originally developed for raising tomato plants by Frederick W. Stanton, Holland, Mich., grower. Successfully used both with vegetables and flowering plants, it is said to double the number of tomato plants that can be grown in a given space and increase the yield per plant.

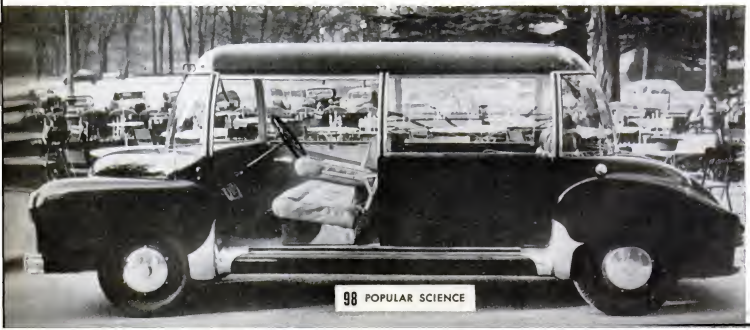
Filled with mica, the bags are set in a long, narrow wooden trench in the greenhouse. Through openings in the bottoms of the bags, the plants absorb chemical nourishment and water pumped into the trench.

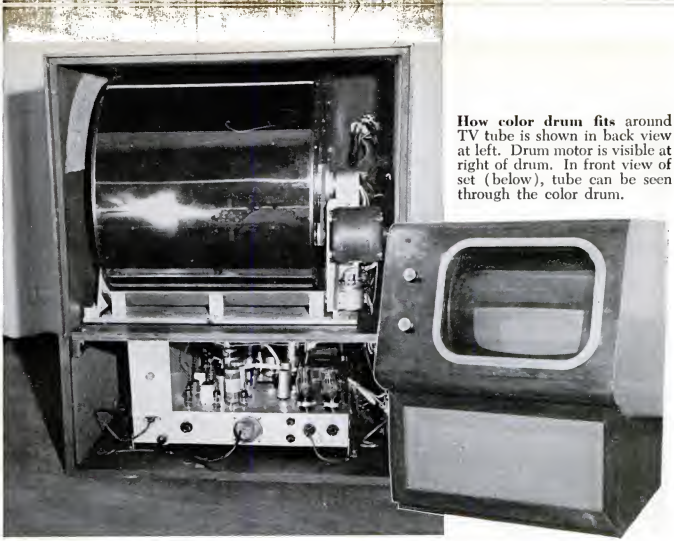
Postcards Ride Sea Currents

Several thousand postcards will be dropped into the Gulf of Mexico this year by Navy aircraft. Sealed in plastic (left), the "drift cards" will float with the currents and be cast up on beaches. Finders are asked to mail them to the Gulf States Marine Fisheries Commission at New Orleans. Thus scientists will be able to trace sea currents important to the fishing industry. Floating bottles, in which cards have been put before, are affected too much by wind.

Motors in Wheels Drive Gas-Electric "Car with a View"

Four electric motors built into its wheels drive a gasoline-electric car called the Symétric, introduced in Paris. A generator driven by a four-cylinder Simca motor supplies current for the transmissionless drive and for braking, eliminating brake drums and lining. Unusual window area gives all-around view. Windows slide into the top, and doors into the floor, as below, to provide unobstructed access.





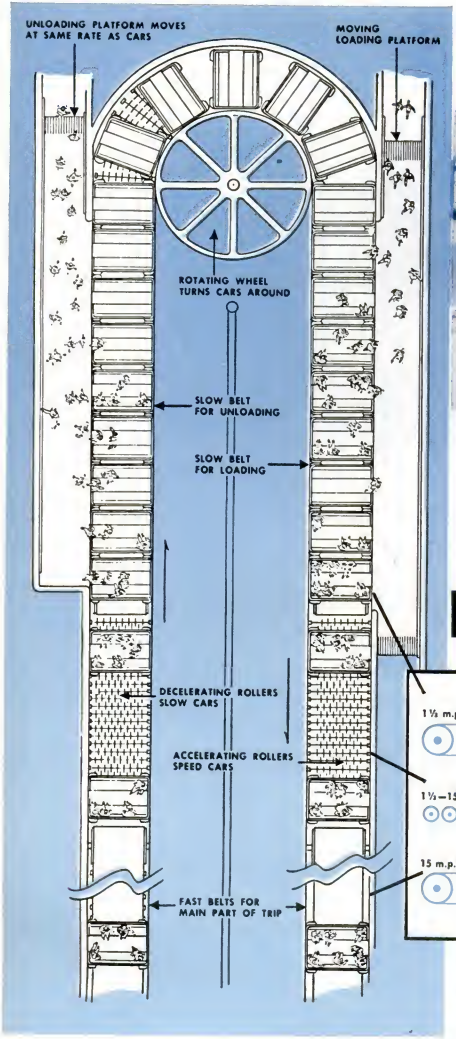
How color drum fits around TV tube is shown in back view at left. Drum motor is visible at right of drum. In front view of set (below), tube can be seen through the color drum.

Big Pictures on Color TV Made Possible by Drum Filter

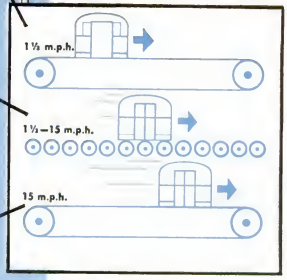
COLOR TV pictures as big as you want are now possible with the Columbia Broadcasting System's color method. Previously picture size had been restricted to about 12 inches, a limitation severely criticized by CBS opponents. Using a drum instead of a disk for the color filter turned the trick. The picture tube fits inside the horizontal, varicolored drum, which spins around it to create the illusion of full color. The drum need be only slightly larger than the tube itself—a drum 20 inches in diameter accommodates a 17-inch tube. A disk for a tube that big would be a yard across.

300-Ton Tank for Refinery so Big It Rides Three Flatcars

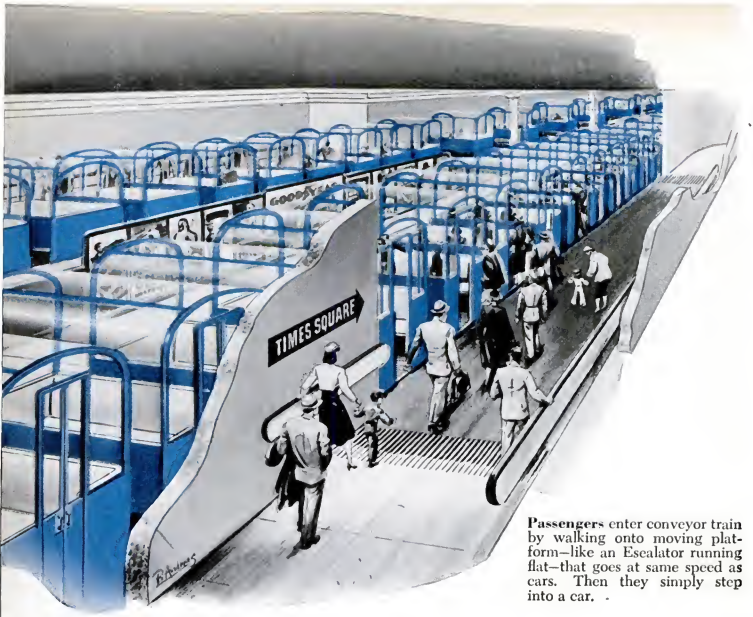
IT TOOK three railroad flatcars to handle this tank—the heaviest piece of oil refinery equipment ever sent by rail. The tank, called a "49-tray depropanizer," is 13 feet in diameter, 120 feet long, and weighs more than 300 tons. Bridges on the route from Houston north had to be checked in advance for strength and clearances.



Endless Train



Car starts out slowly, is speeded up by rollers turning at ever-faster rates to reach the high speed of main-line conveyor. Thus, fast trip can be made safely.



Passengers enter conveyor train by walking onto moving platform—like an Escalator running flat—that goes at same speed as cars. Then they simply step into a car.

to End New York Subway Jam

CARS riding an endless belt could carry more than 500 people a minute across the world's biggest city. Plans for them have been submitted to officials struggling with New York City's traffic congestion.

This new kind of subway train would never stop nor end. Passengers would enter its cars from a sidewalk moving a mile and a half an hour, which is slower than many moving stairways. The cars would speed up to 15 miles an hour for the trip. At the end they would slow down and be turned around by a constantly turning horizontal wheel.

Although small, this train's many little cars could carry nearly twice as many people about a third faster than the crowds transported now by shuttle trains under 42nd St. between Grand Central and Times Square.

This shuttle is one of the worst bottlenecks in New York subways, and the moving-belt system was developed specifically for use there. Its designers, Goodyear Tire & Rubber Co. and Stevens-Adamson Manufacturing Co., say, however, that it could be applied to other subways. END

Proposed design for conveyor cars has clear-plastic top and sides. Automatic doors would be open only when car was alongside platform.

Modelmaker Cloy D. Niver, guided by artist's sketch for a premium, carves whitewood pattern four times the size of future plastic figure. Often he adds intricate touches of his own.

Duplicating machine follows the wood pattern (right) in routing out image one-fourth size in tool steel. Size is important, since all figures must fit later in packaging machine.

How They Make Plastic Figures

PHOTOS BY ALFRED ERIS

EVERY morning thousands of youngsters watch popeyed as their mothers open boxes of their favorite breakfast cereal. What makes it their favorite is not calories, vitamins, or crunchy-goodness—but the realistic plastic miniatures of cowboys, Indians, buffaloes, prize fighters, and skaters that come tumbling out.

These pictures tell the story behind those sales-boosting premiums: a story of skilled craftsmanship teamed up with mass-production methods.

The photos were taken in the plant of Monroe Plastics, Rochester, N. Y., a major producer in this new industry. The company is headed by a young engineer, Irwin E. Copland, who designed most of its machinery. It turns out millions of the miniatures a year in almost a hundred varied models carefully chosen by a vote of advertising and merchandising experts for their appeal to small-fry collectors.

Polisher uses diamond-burnishing compound to remove any flaws or impurities from cavities just before they go to the molding machine. Care here avoids production stoppages later.

Engraver tools minute details, such as horse's mane, into steel pattern. Tool points are specially ground for many miniatures. Finished pattern, called a "hob," is then hardened.

Under pressure of 100 to 300 tons, the hob is squeezed into soft steel blank (lower block). This reverse image, called a "cavity," is used as mold of figure into which plastic is injected.

Plastic figures come out of molding machine in a group known as a "shot." They are cut apart, trimmed, and fed into a packaging machine that seals each separately in cellophane.

Samples of final product are checked by Irwin Copland, company head. In this group are cowboys, hunters, kangaroos, buffalo, ice skaters, football players, deer, farm tractor. END

Roadometer, shown testing a "driver" in photo above, reproduces driving scenes such as those shown at right. Movie starts with view of quiet suburban street. As "car" starts, progressive emergencies are introduced. Falling box and pedestrian episodes are two of three requiring quick stops. Six other incidents are judgment tests, requiring such action as turning and blowing horn. Machine can be adjusted to take any film sequence.

Attendant removes score card from Roadometer after test. Drivers who try for better score by riding brake are penalized for hasty reaction.

Mechanical Cop Scores Motorists

By Devon Francis
PS PHOTOS BY HUBERT LUCKETT

FOR years experts in traffic safety have been trying to invent a machine that would produce a clear test of a person's driving ability. Last month just such a machine was announced.

Exhibited at the annual exposition of the Greater New York Safety Council, it has a "mechanical brain" that tots up a score for —and against—a motorist driving through a series of emergencies. Yet the driver never budges from the testing room.

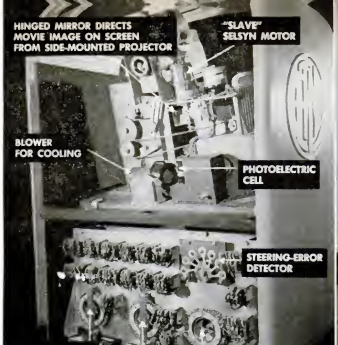
The machine, called the Aetna Roadometer, was introduced by the Aetna Casualty and Surety Co., of Hartford, Conn., which collaborated with the Automagraph Co., of New York, in developing the device.

It differs from previous driving-test machines in that the driver isn't merely rated right or wrong in his reaction to an emergency. If he's wrong, it tells him just how wrong he was—and prints the result automatically on a score card.

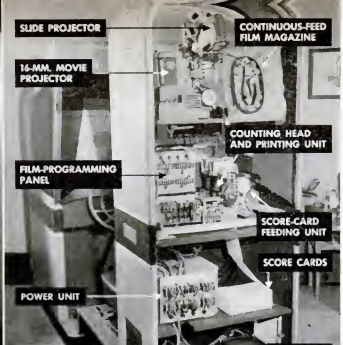
It tells him how well he steers, whether he goes too fast, how quickly he hits the brake pedal, whether he remembers to blow his horn at an unwary pedestrian, and penalizes him if he fails to signal.

He sits in a simulated driving compartment and "drives" along a street pictured on a screen before him by a movie projector. The illusion of a car is complete, even to a hood ornament. A box falls off a truck in his path, and he has to brake to a stop. A pedestrian pops out from between two parked cars into his way. Two cars crowd him on a curve.

The use of movie films in driver-testing is not new. Tests of judgment and steering proficiency, however, are new. So is the automatic scoring. That's done by a complex series of relays, selsyn motors, solenoid counters, and selector switches. The Roadometer can be "driven" from 16 to 40 miles an hour,



Front of control mechanism shows machine's "brains" and steering-error detector. When steering error occurs, selsyn motor, rotating for correct direction and amount of turn, becomes unbalanced with another selsyn keyed to steering wheel. This causes a "slave" selsyn to turn mirror, shifting screen image left or right in response to steering error.



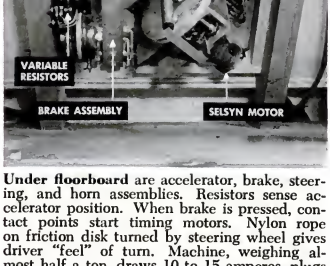
Both slide and movie projectors, together with continuous-feed device for film, can be seen in exposed back of mechanism. Film is interrupted and slide flashes on screen when driver commits error. Film runs at a rate of 16 to 40 frames a second. By changing film programming panel, machine can use films containing new sets of driving emergencies.

but it imposes harsh penalties for speeding by allowing the driver less time to meet an emergency.

The heart of this driving tester is the series of solenoid counters, or accumulators, that record, "remember," and deliver to a miniature printing plant the *degree* of error committed by the motorist.

Here's what happens within the machine to record a score when a "driver" meets an emergency: A transparent spot on the side of the film lets light strike a photoelectric cell. This advances a multi-channel selector switch to the particular contact set up for this emergency. The switch closes a series of relays, giving life to the circuits that will record what the driver does. One of two timing motors starts ticking off the interval allowed the driver to react.

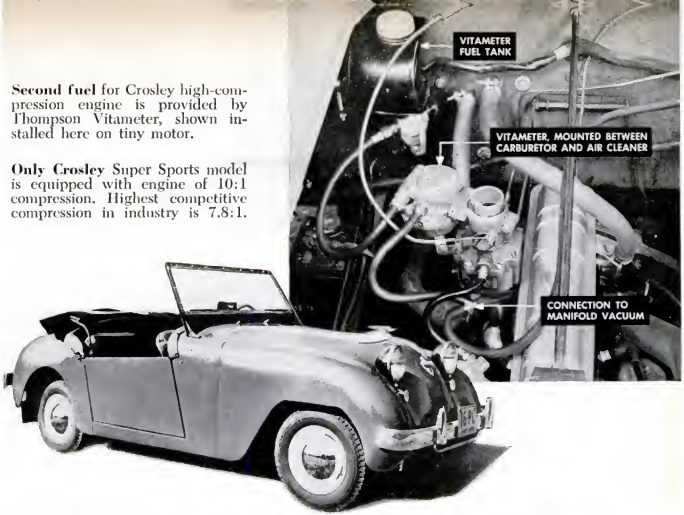
The motor runs until the driver hits the brake. Now a second timing motor, together with a scoring arm on an accumulator, counts the time—in tenths of a second—ticked off by the first timing motor. This records the amount of time it took the driver to stop. Another spot on the film sets off a relay that feeds the score to a counting head, starts the printer, and clears the accumulator so that it is ready to rate the driver on the next emergency.



Under floorboard are accelerator, brake, steering, and horn assemblies. Resistors sense accelerator position. When brake is pressed, contact points start timing motors. Nylon rope on friction disk turned by steering wheel gives driver "feel" of turn. Machine, weighing almost half a ton, draws 10 to 15 amperes, plugs into any 115-volt outlet.

Second fuel for Crosley high-compression engine is provided by Thompson Vitameter, shown installed here on tiny motor.

Only Crosley Super Sports model is equipped with engine of 10:1 compression. Highest competitive compression in industry is 7.8:1.

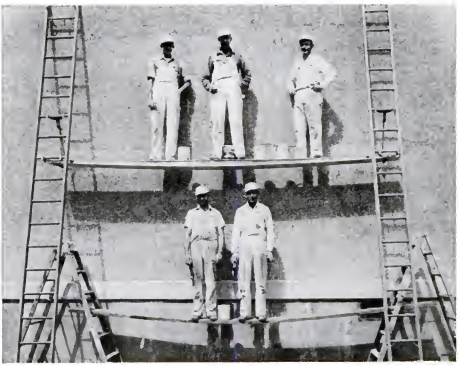


Dual Fuels Give New Crosley Highest Compression Engine

Crosley Motors, the people who make the vest-pocket cars, have announced an engine with the highest compression ratio among stock U. S. cars—10:1. Oddly enough, the engine, installed in Crosley's Super Sports model, uses regular gas.

Crosley avoided premium fuel by fitting its new engine with a dual-fuel system. Under ordinary loads, the engine operates on regular fuel. When detonation—"pinging"—is about to occur, a mixture of alcohol, water, and tetraethyl lead from a second fuel tank is automatically fed to the carburetor to be mixed with the regular fuel. This provides a non-detonating charge that insures more complete combustion and saves power waste.

With the dual-fuel system (PS, Sept. '48, p. 98), the company claims greater horsepower, better hill-climbing ability, higher speed under loads and greater economy for its four-cylinder engine.



Aluminum Scaffold Is Strong, Light

The old wooden-plank scaffold, long used by painters and carpenters, has given way to a stronger one made of aluminum channels with plywood in truss-type construction.

The new plank (upper one at left) supports three men with less sag than a conventional plank with only two men. A 24-foot length weighs only 70 pounds, compared to 230 for a solid-wood plank.

The new plank is made by the Stinson Mfg. Co., of Spokane, Wash.

'Cannon' to Hurl Billion Volts

THE mightiest of "cannon" is being assembled in the microwave laboratory of Stanford University, where trials of it are already under way. The longer it grows, the more powerful it becomes. So far it has reached a length of 80 feet. Eventually it will measure 220 feet long.

This biggest piece of "ordnance" is a linear accelerator for studying atoms. It fires the smallest of projectiles—electrons, tiniest known particles of matter. When it attains full size, probably early next year, it will hurl them at a target with an energy of more than a billion electron volts.

Only three atom smashers in the world, all still under construction at this writing, will match this power.

The Stanford cannon differs from these in its comparatively simple and economical design. Instead of whirling particles in a circle or spiral as synchrotrons and cyclotrons do, it propels them in a beeline, to boost them to fantastic speed and energy.

How the Big Cannon Works

A slender copper vacuum tube, of about six-inch over-all diameter, forms the barrel of the cannon. The "bore" is the 0.8-inch diameter of a central passage through gold-rimmed copper disks, fitted inside the tube. Electrons fed into the "breech" from a cathode tube are sped along the barrel by successive kicks from a series of Klystron tubes, which are called the most powerful vacuum tubes ever built. Speeding unhindered through an aluminum-foil window at the barrel end, the particles emerge with a "muzzle velocity" approaching the speed of light. The Stanford cannon is said to be the only electron accelerator of more than 10,000,000 volts that gets the particles out in the open where they can be conveniently counted, measured, and studied.

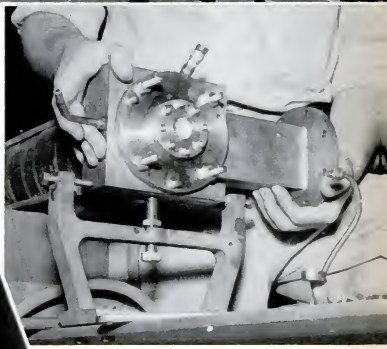
Scientists will use the particles to bombard experimental targets placed in their path, and will measure their energy by deflecting them around a curve with a magnet.

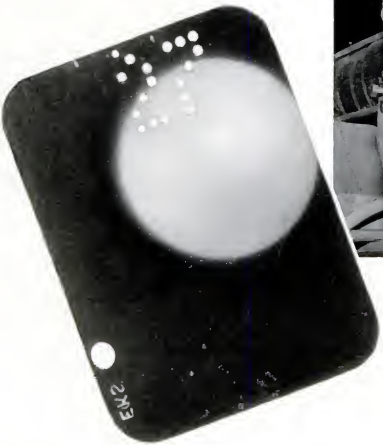
Breech of "cannon" is fed "ammunition"—electrons—by cathode tube, extreme left, through short connecting pipe. Cannon fires them along barrel extending out of picture toward right.

Although invisible, the emerging beam fogs film and registers on scintillation counters that can be used, with oscillograph recordings, to clock the electrons' speed. This may permit the first direct measurements of electrons' mass, hitherto determined by roundabout calculations, and lead to discovery of new subatomic particles forming the mysterious "glue" that holds matter together.

ACCELERATOR TUBE

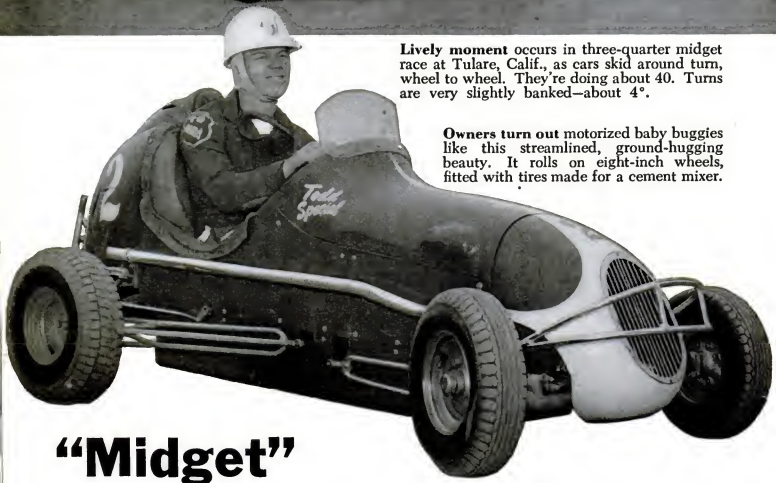
Barrel of atomic cannon, mounted on I-beam for rigidity, has reached 80 feet of eventual 220-foot length. Concrete tunnel will enclose it to prevent escape of dangerous radiation.





At muzzle of cannon, above, electron beam emerges through aluminum-foil window. Even at full power, it will be invisible, but readily detected. Enlargement at left shows large, circular, white imprint of beam on dental film held over window in preliminary trials. Power of 130,000,000 electron volts reached to date will be boosted to more than a billion. END

Lively moment occurs in three-quarter midget race at Tulare, Calif., as cars skid around turn, wheel to wheel. They're doing about 40. Turns are very slightly banked—about 4°.



Owners turn out motorized baby buggies like this streamlined, ground-hugging beauty. It rolls on eight-inch wheels, fitted with tires made for a cement mixer.

"Midget" Midgets Thrill Race Fans

THE tiniest of racing cars are roaring around fifth-of-a-mile outdoor tracks in California. This summer, the motorized baby buggies will move indoors.

They're called "three-quarter midgets" and have wheelbases about three quarters the length of present-day midget racers. Though small, they thrill spectators with the same wheel-to-wheel jockeying. They make dusty skids on banked turns, and hit 45 m.p.h. on abbreviated straightaways. Some can do 90 on a long straight dash.

Their predecessors, the midgets, first came upon the scene in 1932. Promoters of bigger racing cars were then moving to longer tracks, some 2½ miles long, taking much of the action too far from the spectators. Midgets raced at first on tracks 1/5 mile and 1/6 mile long. Then midgets in turn went to longer tracks, some a mile long, and grew

in wheelbase, body length, and tread. Too far from the spectators, again.

To put the show back in the crowd's lap, a new group of promotors has come up with the "three-quarter midget" idea. The "three-quarter" corresponds to the original midgets in general specifications, but with newer engines instead of the old Saxons and Hendersons.

Most of the three-quarter midgets are home-built with small garage lathes and welding outfits. A handsome blue home-made job built for $350 by Curly McLain, of San Diego, stood third in the 1950 championship class. Tops for parts cost of a homemade three-quarter midget is about $800, and excellent ones may be bought ready-made at prices from $800 to $2,000. One slick $2,000 job is powered by a 34-hp. English twin-cylinder Triumph motorcycle engine, souped-up to develop 40 hp. at 7,000 r.p.m. It weighs 460 lb. empty, is seven feet long with a 60-in. wheelbase.

Some cars use single-cylinder J.A.P. motorcycle engines of 30.50-cu.-in. piston displacement. Other owners choose the flathead, twin-cylinder Harley-Davidson 45, the Indian twin, or the four-cylinder in-line Crosley single overhead-cam engine, sleeved down to meet specifications of the Three Quarter Midget Racing Association. Compression ratios range from 7-1 to 15-1.

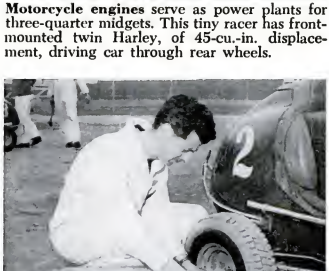
In back yards and small garages around Los Angeles, ingenious mechanics try a hatful of dodges to build greater speed and safety into their cars. One engine burns methanol fuel, another alcohol. Racing heads soup up an engine. Plastic shock absorbers smooth out bumps.

The cars have no self-starters, and only one gear. A nudge from a truck to start them, and they're off. Curves are slightly banked to help the cars negotiate them. At that, the wooden walls are scarred by hub caps, and cars have jumped the wall.

To keep the sport from becoming only a rich man's hobby, the T.Q.M.R.A. runs the events as claiming races—but at a fixed price of $2,000. No one is likely to pay that for a car he can buy off the track or make himself for much less. And the owners, knowing that is the most they can get for their tiny mounts, are not likely to put a lot of money into them. So both ways it helps hold down the cost of the cars.

To keep the spectators happy, the T.Q.M.R.A. is shooting for a 1/6-mile track —to bring the show to the customer. END

Motorcycle engines serve as power plants for three-quarter midgets. This tiny racer has front-mounted twin Harley, of 45-cu.-in. displacement, driving car through rear wheels.



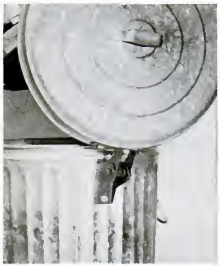
Pit mechanic, fixing flat, inflates tire by attaching bottle of compressed air with hose. Bottle once carried oxygen in B-29 bomber. Welded wheel guard prevents hooking in turn jams.

SPECIFICATIONS

	THREE-QUARTER MIDGET	MIDGET
POWER	35-40 HP.	100-120 HP.
WEIGHT	450 LB.	850 LB.
WHEELBASE	60 IN.	72-74 IN.
TREAD	40 IN.	45 IN.
HEIGHT	35 IN.	37 IN.
COST	$500-$2,000	$3,500-$6,000

Aids to Modern Living

Board Has Gliding Top. To reach the neck and shoulders or the bottom of the garment you are ironing, you just shift the top of this board to the right or left and lock it in position. Made by Leisur-Maid Mfg. Corp., of Grand Rapids, Mich., the board folds for storage. It is priced at about $12.



Hinge Holds Can Cover. A garbage-can cover won't get lost if this hinge is screwed on. For use on any size of can, the steel hinge is available from Melaire Distributing Co., N. Y., at about $2.25.

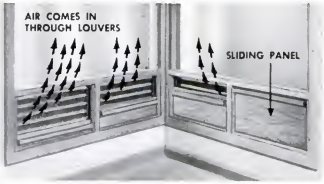
Transfers Are Washable. Once ironed onto a fabric, Fabri-cals are said to withstand scrubbing. Made in many designs by Meyercord Co., Chicago, they are sold for 25¢ a sheet.

Collapsible Toilet Seat. This child's plastic seat folds to 4¼ by 8 inches for convenient carrying when traveling. It is priced at about $2 by the Toddler Sales Co., of San Mateo, Calif.

Fan You Can Assemble. Less costly than a comparable preassembled unit, a new GE kit consists of a 10-inch blade, AC motor, cord, brackets, and screws. Intended for built-in application in kitchens or attic rooms, the kit is priced at about $13. The fan is capable of moving 360 cubic feet of air a minute. Assembly takes 10 minutes.

Bag Has Shoe Compartment. A zippered section in this nylon satchel keeps shoes separate from other clothing. Leed's Travelwear Corp., New York, sells it for about $15.

Pint-Size Garden Tools. Here's a set of small-scale tools for potted-plant and window-box gardeners. Village Store, Lake Placid, N. Y., sells them for about $2.



Window Has Built-In Louvers. Both fresh air and an unobstructed view are provided by this corner picture-window unit with built-in wooden louvers mounted underneath the glass. Vertically sliding panels control incoming air. Lilly-Vent, Inc., of Portland, Ore., makes it in all sizes.

Nut Cracker Works Like Jack. With each squeeze of the lever, the crossbar holding the nut moves up a notch, applying travel-limited pressure that breaks the shell but leaves the kernel whole. Priced around $3, the English import is available from Hoffritz Cutlery, New York City.

Chromatography strips the four tons of ox liver above of their minute fraction of vitamin B_{12}. All this liver gives only 1/30th ounce of crystals in test tube held by British chemist.

How Chemists Can Cut Liquids With a Knife

IT TAKES all of those four tons of ox liver above to make the few crystals of valuable vitamin B_{12} in the test tube held by this British chemist. But thanks to a chemical process called chromatography, such a fantastic extraction job becomes almost routine.

Chromatography, discovered back in 1906 by a young Russian botanist named Michael Tswett, practically lets you cut up liquids with a knife. It depends on the fact that certain materials will *ad*sorb (pick up on their surface) other materials from solution. And the speed of adsorption depends on the particular materials involved.

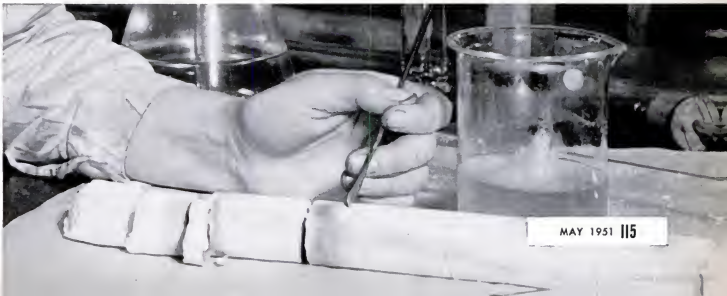
Thus, when a solution containing only a tiny fraction of the stuff you want (B_{12}, for example) mixed up with lots of other stuff is poured through a tube containing the right adsorbent, the B_{12} will all be trapped in one section of the tube. The unwanted materials in the solution will be trapped in other parts of the tube—the faster adsorbing materials above B_{12} and the slower adsorbing materials below.

Then all the chemist has to do is push out the column of adsorbent and cut out the section that has B_{12}. Usually he can find the stuff he wants by its color (hence the name, *chroma*tography), but other identification methods can be used.

Chromatography has become increasingly important recently in much biochemical research, not just in B_{12} extraction. In this country, vitamin B_{12} is usually made by a fermentation process, like penicillin.

Crude liver extract is poured through big adsorption columns. Because different compounds are adsorbed at different rates, B_{12} fraction will collect in one small section of a column.

After adsorbing material is pushed out of tube, desired fraction, now concentrated in one place, is simply cut out with knife. It can then be dissolved and crystallized in pure form.



Model Fans Plan Their Dream Railroad

By R. DeWitt Miller
DRAWINGS BY WALTER POPP

MOUNTAIN snow swirled outside the cabin. Inside, around a friendly, crackling fire, sat a group of men, their minds far from the weather, the place—and reality. They were dreaming the great American dream: what they would do with lots of money to throw around.

This time the dream wasn't push-button houses or sleek sports cars. It was the Great American Plaything. Electric trains. Anyone who ever says that he has lost interest in model trains is a liar. Everybody knows that.

What these men sitting around the fire did was simply to concoct the most tremendous and incredible model electric railroad ever. It was no static, regimented railroad that

just keeps cars moving past miniature stations and through papier-mâché tunnels. This model-railroader's heaven would be an unpredictable world. There would be wrecks and landslides; rain and snow; sunlight, darkness, and dawn.

And yet it was a very real railroad—in the sense that it could be built. Every detail is within present technical know-how.

Towers house engineers above the switchmen.

Once the money is collected, the rest of the dream could become reality.

Here's how it would look:

The railroad is housed in a gigantic hangar-like building about the size of a city block, and three or four stories high. Seven feet above the floor an immense table, covering the entire area of the building, has been constructed. Mountains, valleys, plains, and deserts are built on this platform. Trap doors, strategically placed and camouflaged, give access to the surface of the table.

The huge room beneath the platform contains shops for the building and maintenance of the dream world above. A network of wires connects sections of track, control panels, switches, light systems, automatic uncoupling ramps.

Through the mountains and valleys of this miniature world run miles of tiny rails—in long straightaways and easy curves, or climbing in tortuous switchbacks across the mountains. The entire layout is built to what model railroaders call HO gauge (tracks ⅝ inch wide), which is based on a scale of approximately ⅛ inch to the foot. Men and women in such a world are about ¾ inches tall. A 3,000-foot mountain towers 30 feet. Boxcars are six inches long.

Over the rails of this Lilliputian land roll dozens of electric trains. These vary in length from five to 50 cars. There are sleek streamliners, standard Pullmans, long freights, strings of coal and tank cars.

Streams and rivers flow gently beside the tracks or foam down mountain gorges. Across them tiny rails are supported on the spans of miniature bridges. The water supply is piped beneath the table.

The entire railroad is divided into blocks, or sections of track. There is a station for each of these blocks. Some of these stations are located in miniature cities, others in desolate mountain hamlets. Near every station is a tower reaching almost to the roof of the shed. These towers have two glassed-in compartments, one above the other.

In the lower compartment sits the switchman for that particular block of track. In front of him a complicated panel controls any switch in his block. The switchmen wear headphones and transmitters so that they can keep in constant communication with the engineers, repair crews, yardmen, and, of course, the dispatcher.

The top compartment of each tower houses one or more engineers. Each engineer controls one train operating on the layout. With a system technically known as "cab control," he has almost complete control of his train at any point along the miles of track in the huge shed.

Each engineer uses two controls, a throt-

Dispatcher sees control panel, not trains.

tle for adjusting speed and a reversing lever. Through binoculars he peers across the landscape, trying to keep his train in view. Often the mountains, forests, or tunnels hide it. Sometimes it enters a curtain of rain or falling snow. Then he must run his train blind, under dispatcher's orders.

The key man in the whole layout is the dispatcher—*but he never sees the dream world at all.* He sits in an air-conditioned, windowless cubbyhole. On his desk is the day's operating schedule and dispatching sheet. Lights flashing on a map of the entire layout show movements of each train.

Through the dispatcher's headphones pours an endless stream of information from engineers, switchmen, and maintenance crews. Into his microphone the dispatcher gives the orders that sidetrack a freight, highball the streamliner through, untangle the mess when disaster strikes.

Dream's big surprise is "dynamite" train.

Engineers must cope with sudden landslides.

A "day" on this railroad is only four hours long. (For convenience, the dreamers decided to speed up the rotation of the earth.) All clocks and timing devices work on a six-to-one gear ratio, allowing just four excitement-filled hours from dawn to dawn.

And dawns are very real dawns. Banks of floodlights begin to glow, then slowly brighten. First the outlines of the mountains show, then the long parallel lines of rails gleam in the dimness. Tower lights in the yards wink off; lights in cities and passenger-train windows go out. Daylight comes.

Now the dispatcher, the men in the towers, and the maintenance crews know that in two hours black night will follow. Then come those 120 minutes when the engineers must stare through darkness trying to follow the tiny lights of their trains.

Each time the sponsors of the railroad gather for a contest, they face a prearranged schedule. There will be so many freight cars to be moved to their various destinations. The streamliner and fast passenger trains must travel so many miles, involving many laps around the main line. Cars must be shunted onto sidings and trains made up.

The operating schedule for each "day" will be different, but all schedules will be equally difficult. At monthly intervals during a period of perhaps a year, a different set of operators, from dispatcher to repairmen, will run the layout. The team most successful in handling its schedule will be adjudged the winner.

As to the prize . . . we're still dreaming, so money is no obstacle. Or perhaps the honor of being on the team that won the world's strangest and most elaborate game would be sufficient reward.

But that's not all. In this game, darkness and ordinary breakdown will only be minor hazards. Pre-set devices will, at times and places unknown to any of the operators, let loose torrents of rain and blinding blizzards

of snow. The rain will come from a net of sprinklers above the layout, and the snow from dry-ice chutes. Maybe we'll need miniature snow ploughs to clear drifts.

But the pre-set timing devices will have even more sinister purposes. A number of small explosive charges will be placed at strategic points around the layout. The location of the charges and the moment of explosion will be unknown.

When those explosions occur bridges and tunnels collapse and landslides bury sections of track, or perhaps bend a single rail.

Such "minor accidents" will continually upset the operating schedule. But if a train wreck is involved—perhaps a string of 50 tiny cars toppling off a shattered bridge and plunging down a 30-foot mountain into a river below—there will be real trouble.

Repairs to the right-of-way will be made by the maintenance crews. Popping up through the trap door nearest the point of trouble, they will lay temporary track, rebuild bridges, clear away landslides, put cars back on the rails. Damaged rolling stock will be taken to the shops beneath the table. Repairs will be rushed. A shortage of units might be disastrous.

It was suggested that one end of the shed be glass, to let spectators in a grandstand watch the drama of the toy-train paradise. This idea was enlarged until all the walls of the shed were windows, and the cost of operations was paid for by charging admission.

Then somebody proposed that all sorts of hobbyists could be called upon. Model builders could produce miniature trucks, automobiles, farm equipment, tiny human beings—all built to scale. Garden-club members could lay out and plant fields and forests, using real grass, miniature flowers, and dwarf trees. Architectural students could design and construct buildings.

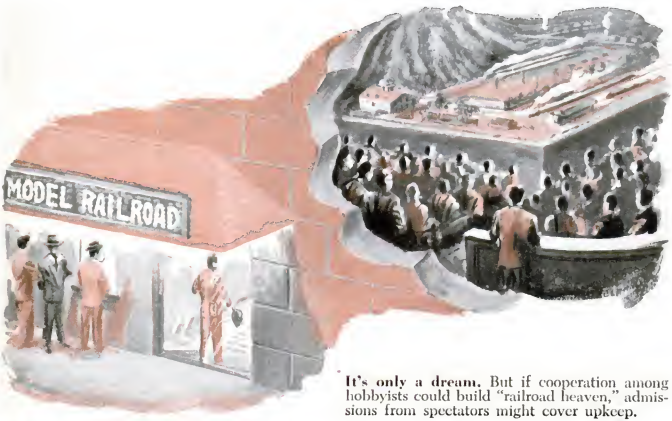
Then a man who had been pumping at the fire with a broken-down bellows said: "Maybe we wouldn't need millionaires. Maybe just cooperation would do it."

But the discussion had already switched to a new and ultra-diabolical proposal.

Whenever the layout was in full operation, a short freight train would follow a schedule calling for almost constant movement. The boxcars of this train would be loaded with "dynamite"—small explosive charges that would be set off by any abrupt jar. Should this train be in an accident, or even be roughly handled by its engineer, *blooey!* The train would blow up, making an awful mess and taking out a lot of track.

About then the session broke up, and the drama suddenly became just a dream. But somehow it seems better to dream of things like that than the wars that most of the human race has always dreamed about.

Anyway, it was a swell idea. Somebody ought to build it. END



It's only a dream. But if cooperation among hobbyists could build "railroad heaven," admissions from spectators might cover upkeep.

Private Transport Flies 200 M.P.H.

One of the few high-wing transport planes produced in the U. S. in recent years, the Aero Commander above is powered by two 260-hp. Lycoming engines. It has a speed of 200 m.p.h., and can carry up to seven persons in comfort. Aero Design & Engineering Co., Oklahoma City, is building the executive-type plane, which can climb 600 feet a minute on one engine.

Toy Uses Bubble Gum for Basketball

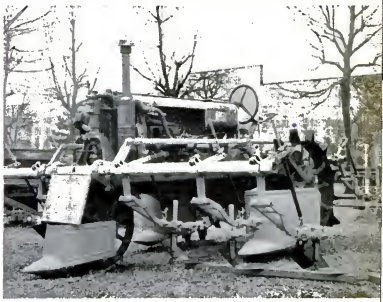
A penny isn't enough to get bubble gum out of this new toy bank. A coin releases the ball of gum, but only into a chute. It must then be shot through a basket, like a basketball, before it comes out. Leaf Gum Co., of Chicago, makes the basketball bank.

Jap Binoculars Are World's Largest

With these binoculars, Japanese sailors could read a ship's name at 20 miles. The world's largest, the binoculars have 75-power eyepieces. This pair is the only one remaining of 12 built during World War II. The others are in Davy Jones' locker.

Reds Show Off New Farm Machinery

The world got a rare peek at Russian farm machinery during a Paris exposition recently. One machine (lower photo below) plants tomatoes or tobacco; other cultivates cotton.



New rubber drums are easily rolled around. Rounded corners facilitiate handling. As yet they are made only in limited quantities.

Photo shows drum in three stages—empty, partly filled, and full. Of 55-gallon capacity, they weigh less than 30 pounds when empty.

Soft Drums Are Lighter, Safer

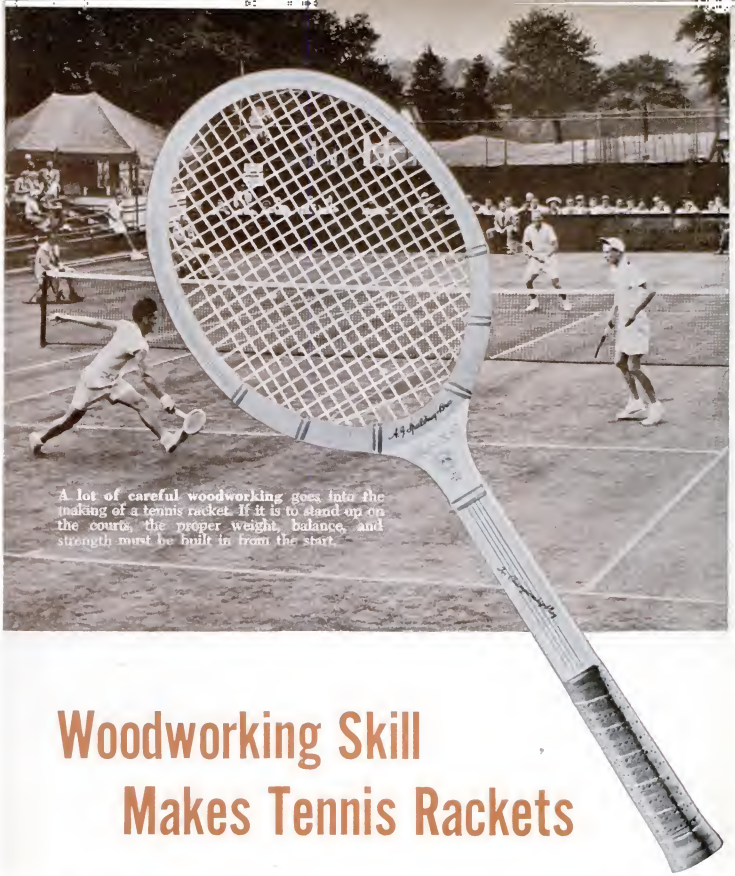
FLEXIBLE drums, as flat as the proverbial pancake when empty, are going to compete with metal containers for the shipment of such items as oils, greases, fats, acids, paints, emulsions, and soaps.

The United States Rubber Co. is manufacturing the drums after nearly three years of development and testing work. Each drum is made in one piece of a cord fabric impregnated with synthetic rubber. Use of the new container is expected to save time and expense in shipping empties. More than 2,500 of them, collapsed, can be shipped in a standard railroad boxcar that would hold only 300 rigid drums.

Because the drums are considerably lighter than metal ones, the company expects them to find use in the transportation of liquids by air and for dropping liquids by parachute to ground troops.

The drums are tough, easy to lift, and can be rolled and stowed easily. They're noncorrosive, nonabsorbent, and resistant to weathering. When full, they retain their shape. They need no venting while being filled or emptied, and therefore eliminate a hazard in handling dangerous acids and combustible liquids.

Liquid is valved from partly collapsed drum. Atmospheric pressure flattens the container.



A lot of careful woodworking goes into the making of a tennis racket. If it is to stand up on the courts, the proper weight, balance, and strength must be built in from the start.

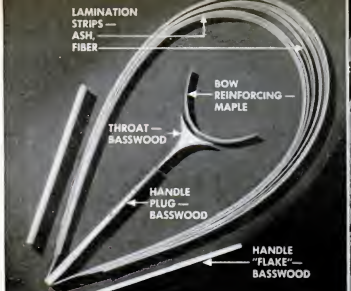
Woodworking Skill Makes Tennis Rackets

By George H. Waltz, Jr.

PS PHOTOS BY HUBERT LUCKETT

SEVENTY-EIGHT years ago, when the game was first played in England, it was called "Sphairistike" (sphere and stick). Today, it is known as "lawn tennis." But regardless of what you call it, or whether you play it on a grass, clay, composition, or indoor court, one of the prime requisites is a good tennis racket—and that means specialized skill in woodworking.

If you were to visit a tennis-racket plant, like the big A. G. Spalding & Bros. factory at Chicopee, Mass., you would see skilled workers using the industrial counterparts of the same machines that make up a well-equipped motorized home workshop. Planers, circular saws, shapers, sanders, drill presses, and routers all play an important part in the forming of a tennis racket, as do such hand woodworking operations as gluing and laminating, sanding, countersinking, wood filling, and paint and lacquer



1 Here are basic parts that go into a tennis racket. The wood laminations are 64-in.-long strips cut freehand with the grain from clear, second-growth mountain-ash boards.

2 After being carefully selected for color and grain, the strips are coated with glue. Then the proper number, together with fiber strips, are bowed inside a metal strap.

5 After 4 hours of kiln drying and 8 of air drying, the clamped form is removed and the basic glued laminated racket frame starts down the woodworking production line.

6 First, one side of each frame is machine-planed to provide a smooth working surface. Then the second side is machine-planed down to the proper frame thickness.

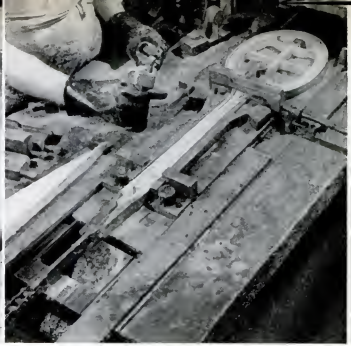
spraying. Except for the strings, the leather grip, and a few reinforcing pieces of rawhide and fiber, the modern laminated tennis racket is a product of wood, glue, and skilled craftsmanship.

A Spalding racket actually begins on large tracts of land in northern New England where the lumber is grown. The most important wood involved is the clear, straight-grained, second-growth ash used for the thin laminations that form the heart and muscle of the racket. It takes approximately 60 years to grow an 8- to 10-inch ash tree that will provide only enough high-quality strips for 200 rackets.

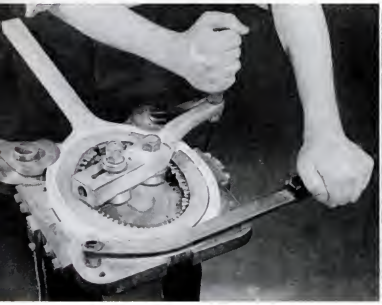
After the trees have been felled and cut up into boards, the boards in turn are sliced up into thin strips by experienced workers who carefully follow the grain of the wood freehand as they guide the lumber through double-bladed gang saws. Carefully dried to the proper moisture content, the strips are then graded according to color and size and straightness of grain. At least six of these strips go into every laminated racket.

Once the lamination strips have been graded, the gradual building-up process of making the basic racket frame begins. Selected maple is steam-bent and cut to form the inner reinforcement for the head, or bow. The plug, or interior part of the handle, and the throat wedge, a V-shaped

3 Strap and strips then go to bending machine. Straps are placed around a metal core, and ends are attached to a hydraulic plunger. Then other wood parts are put in place.



4 When operator touches a pedal, the plunger pulls strap tight and arms force the sides of the form in. Clamps are then placed on form and it is removed from machine.



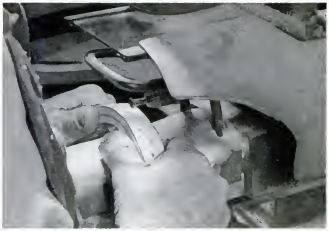
7 The locations of the string holes are marked in this jig. When frame is clamped in place, turning the handle on top of the jig forces pins out to mark inside of the bow.

8 The holes are then drilled. No one operator drills all the holes in any one frame. Each is a specialist who has been trained to handle a specific portion of the head.

piece, are sawed from kiln-dried basswood.

Finally, these assorted pieces of ash, basswood, and maple come together at a combination bending and pressing machine where they are coated with a plastic glue and formed under tremendous pressures into the laminated racket frame. Forces greater than 1,000 pounds per square inch press the glue-coated parts together around a metal form. Screw clamps are then applied, and the form is placed in a kiln to dry the glue. After about 12 hours of kiln and air drying, the frame is ready for the various woodworking operations that will convert it into a finished racket.

In rapid order, the frame is planed to

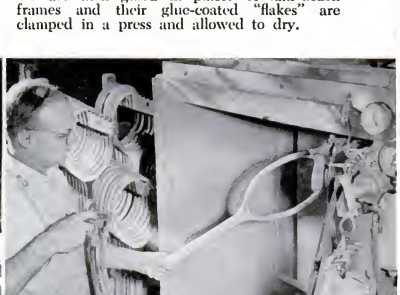


9 After holes are drilled, grooves are routed from hole to hole on outside of the upper end and sides of the bow. These grooves will protect the strings from injury.

10 **A vertical shaper** is used to form rounded edges on the inside and outside of the bow. A guide under the revolving cutter determines how much wood can be removed.

11 **The side pieces on handles,** called "flakes," are then glued in place. A half-dozen frames and their glue-coated "flakes" are clamped in a press and allowed to dry.

14 **Weight and balance** are important in a tennis racket. Here, both are checked and corrections are made by inserting a leaded rubber plug in hole drilled in handle.



15 **Finishing consists** of filling the wood with a mixture of turpentine, oil, and wood flour, and then applying multiple spray coats of colored and clear lacquers.

proper thickness, the string holes are marked and drilled, the head, or bow, is beveled and chamfered to shape, the handle pieces, or "flakes," are glued into place, and the handle is formed. Although machines do much of the actual work, the hands of skilled woodworkers guide the frame through the various operations.

Weight and Balance Are Vital

Weight and balance are particularly important in a tennis racket. If either is off, a slug of leaded rubber, cut to provide the right weight, is inserted in a hole drilled in the handle butt. A wood plug holds the slug in place.

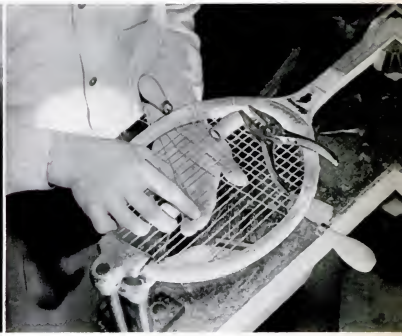
After the frame has been spray painted, decorated, and lacquered, the leather grip is applied and the racket goes to the stringers. Here, again, deft hands place the vertical main strings and weave in the cross strings. Working with awls, pliers, and special hooks, the stringers are capable of pulling each string to a uniform tightness of between 50 and 55 pounds.

Finally, operators thread in the colored trim that you find at the top and bottom of the strings on most rackets. Oddly enough, neither this string trim nor the bindings on the racket head add any strength to the racket. They are merely decoration. Years ago, someone put them on a tennis racket and now both pros and dubs insist that they be there.

12 **Final shaping of the handle** and the bow is done by hand by skilled operators on cylindrical "balloon" sanders. After machine sanding, the frames are hand-sanded.

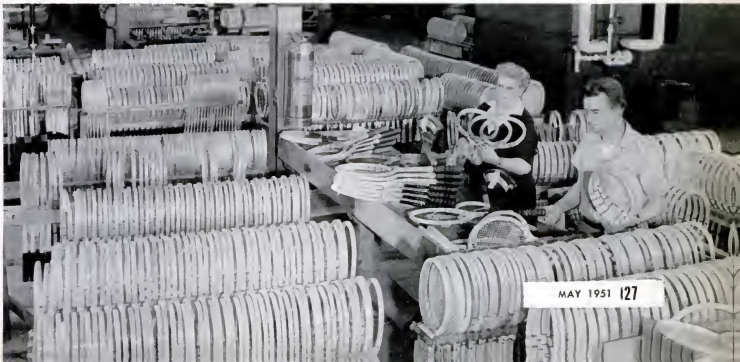
13 **"Balloon" sanders** get their name from the fact that their spindles are not solid, but are rubber cylinders that can be inflated to provide just the right amount of cushion.

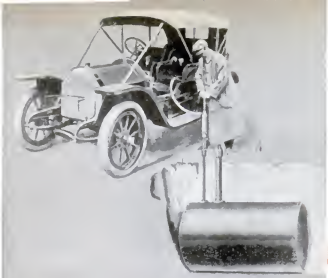
16 **After the decorative bindings** and decalcomania labels have been applied, a cap is put on the butt of the handle and the leather grip is glued and wrapped into place.



17 **Stringing** is final manufacturing operation. In some cases, racket is left unstrung so that the ultimate buyer can pick out the type and quality of string he desires.

18 **Final inspection.** When photograph was taken, there were from 70,000 to 80,000 tennis rackets on plant floor progressing through various manufacturing steps. END





Gilbarco T-1 hand pump did fine job of gassing up old buggy at turn of century. Company makes many of today's pumps.

How a Gas Pump Works

It's a long way from the oldtime hand gas pump to the automatic machines that fill the tank and figure the price.

By Richard Giovine

DRAWINGS BY DAN TODD

EVERY time you pull into your favorite service station for gas, you make use of a tricky mechanical device whose operations have probably intrigued many of the nation's 56 million drivers. The diagram at right shows how a pump fills your car.

The attendant removes the hose nozzle from the port and at the same time turns the "This Sale" dials back to zero. An interlock switch prevents delivery of gas until all indicator dials have been returned to zero.

This action starts a ½-hp. motor belted to an internal-gear pump (sliding-vane pumps and herringbone-gear pumps are also widely used). As the pump builds up pressure before the nozzle is opened, a safety valve opens a by-pass that allows the gas to return to the suction side of the pump to keep pressure from climbing too high. The opening of the nozzle to start the flow of gas causes a decrease in the pressure at this point and the safety valve snaps shut, allowing the gas to flow.

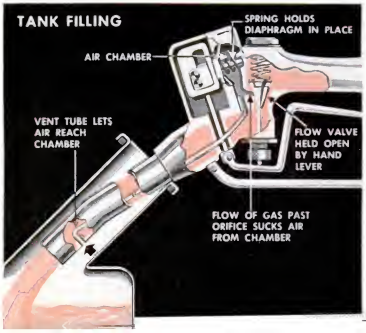
From the pump, gasoline moves to the air separator—a kind of settling tank that removes air bubbles. The airfree gasoline then goes to the meter—really a kind of turbine or pump in reverse. As the gas flows through the meter, it turns a crankshaft—one turn for every gallon. These turns are then translated into gallons and dollars and cents on dials—accurate to .3 of 1 percent.

Last leg of the trip is to the top of the tank, where the gasoline sets vanes spining behind a glass viewer to tell the customer that his gasoline is really airfree.

As the attendant lets up on the nozzle handle, a two-way pressure-regulating valve is tripped. This traps the gasoline in the line under pressure to keep it full and minimize loss through vaporization. If too much pressure accummulates, the valve bleeds it back around the pump, thus preventing damage to the hose.

Hoses get longer and longer. Some can deliver gas to an automobile a full 16 feet away. The extra length is automatically retrieved by weighted pulleys. Nozzles are of non-sparking brass, aluminum, or rubber, and usually have a two-speed adjustment for slowing the gas as a tank nears full.

Safety-fill nozzles with automatic shut-offs protect a car from spilled gas and save waste. Flow of gas past orifice sucks air from chamber, but as long as chamber is vented by air tube to nozzle, vacuum can't build up. When level of gas closes vent, vacuum moves diaphragm that drops pivot end of lever, closing valve.



FLOW OF GAS SETS TINY PROPELLER SPINNING

INTERLOCK RETURNS DIALS TO ZERO FOR EACH NEW DELIVERY

PRICE PER GALLON CHANGES MADE BY ADJUSTING DIALS

TWO-WAY PRESSURE CHECK VALVE SNAPS SHUT AS GAS FLOW STOPS, LETS EXCESS PRESSURE BLEED BACK

CALCULATOR DIALS TURNED BY METER CRANKSHAFT

ROTARY METER HAS SINGLE ECCENTRICALLY MOUNTED PISTON

AIR VENT

SUMP FLOAT RISES WHEN LIQUID COLLECTED FROM VAPOR HAS ACCUMULATED, RETURNING IT TO PUMP

SWITCH STARTS MOTOR AS NOZZLE IS REMOVED FROM PORT

MOTOR

AIR BUBBLES AND GAS VAPOR ENTERING SEPARATOR RISE TO TOP AND PASS TO SUMP

SAFETY VALVE ALLOWS GAS TO RETURN TO PUMP BEFORE NOZZLE IS OPENED

PUMP

TANK FULL

VACUUM BUILDS UP IN CHAMBER, PULLING DIAPHRAGM INWARD

AS DIAPHRAGM MOVES, ROLLER PIN AND STEM ASSEMBLY DROPS

AIR HOLE BLOCKED BY RISING GAS

PIVOT END OF HAND LEVER DROPS OUT FROM UNDER FLOW-VALVE STEM

LOSS OF LEVERAGE LETS SPRING CLOSE VALVE, SHUTTING OFF GAS FLOW

This Ypsilanti, Mich., house was constructed of surplus materials bought at discount from an automobile factory. It contains reclaimed lumber and bricks as well as auto-seat upholstery fabrics, floor mats and, as furnishings, even surplus seats. House, including garage, is 62½ feet long. Kaiser-Frazer Corp. sells such surplus materials to public.

Recreation room is finished in easy-to-clean pyroxlin and vinyl cloth. Barenow is shown kneeling on a surplus car seat, one of four, purchased at $25 each, used to furnish the room.

House Built

PROBABLY one of the most unusual houses every built has just been completed at 1791 Washtenaw Street, Ypsilanti, Mich. It was constructed almost entirely of surplus materials bought from an automobile factory.

The walls of one room are finished in pyroxlin and vinyl cloth, the materials used in automobile interiors, and they make cleaning an easy job.

Stairway pads are made from automobile rubber floor mats.

The living-room furniture is covered with luxurious car-upholstery fabrics.

Surplus car upholstery was made into bedspreads, rugs, and draperies.

Auto deck-lid mats insulate the walls.

Surplus car seats provided soft chairs for the recreation room.

Even the bricks and lumber that went into the house structure were recovered from auto-company surplus.

The owner, M. E. Barenow, merely took advantage of the fact that the Kaiser-Frazer Corp., at Willow Run, sells discontinued lines of fabrics and surplus materials at re-

Five-member family spent weeks removing mortar from reclaimed bricks (background) and nails from lumber. Owner Barenow and son Dick, 23, did much of the heavy construction.

Barenow (in jacket) contracted for and supervised the work his son and he did not do. He used auto deck-lid mats, surplus from 1946 Kaiser car, as an insulating material.

from Auto-Factory Surplus

duced prices to the general public. The entire Barenow family—including two daughters and a son—worked at building and furnishing the home. Mrs. Barenow and her two daughters, Nancy and Laurie, sewed the draperies, bedspreads, and covers. Barenow and his son, who is employed in the Kaiser-Frazer machine shop, did most of the heavy work.

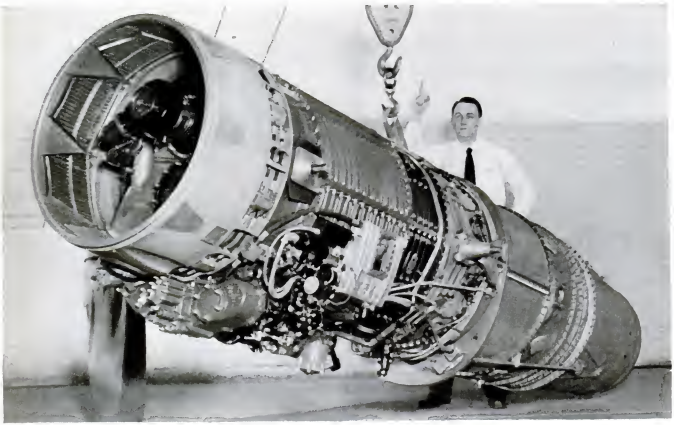
Manager of the company's retail stores, Barenow says his home cost $22,000. But a visiting architect reported the seven-room structure couldn't be duplicated with conventional materials for $35,000. END

In their living room, Mr. and Mrs. Barenow sit on canyon-rose love seat upholstered in Normandie cloth, resembling handmade needle point. This is used in the trim of the Frazer car.

Bedroom of pretty, 20-year-old Nancy Barenow demonstrates use of auto fabrics. Rugs are made of Bedford cloth, chair is covered with Normandie. Her skirt is seat-cover Botany cloth.

Rubber Tires Replace Steel

THIS new butterfly-shaped tire (left above) for use on corn planters is made of rubber. The high shoulders press the soil into the furrow to cover seed dropped in front of the wheel. This unusual shape is retained even when fully inflated. The new tire, made by B. F. Goodrich, replaces similarly shaped steel wheels that tend to clog up in wet earth and slip on hillsides, resulting in uneven distribution of seed. The rubber also cushions shocks, reducing wear.



Most Powerful Turbojets to Drive B-47

THE most powerful turbojet engines being produced in the U. S. will soon be installed in the Air Force's only all-jet superbomber—the Boeing B-47C.

The thrust of these Allison J35-A-23 engines has not been disclosed, but four of them will pack more power than the six now driving the big bomber. The reduction in the number of engines is expected to result in weight and fuel economies and extend the flight range.

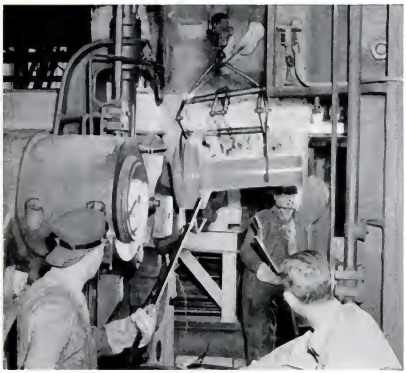
The new engines will have "cannular" combustion chambers—a big outer chamber to which air from the compressor is fed, and eight cans within it where the fuel and air are burned. The engine is 172 inches long and 37 inches in diameter.

Propeller Squeezed From Hot Metal

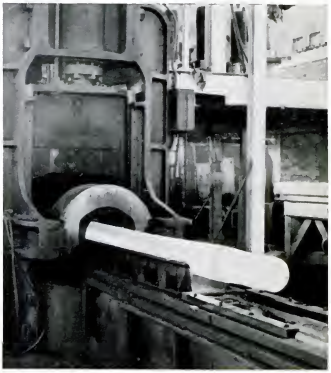
HOLLOW-STEEL propeller blades for high-speed combat and commercial aircraft are now being squeezed out like spaghetti. Extrusion—the art of shaping metal in a continuous form by forcing it through a die—is of course not new, but the method has never before been used to produce the complex shapes and tapered wall thicknesses required in prop blades. The process, developed by Curtiss-Wright and the Air Force, results in a stronger blade, and reduces hours of skilled handwork to a simple operation that takes only minutes.

A 400-pound steel billet (left) is heated and squeezed through series of dies to produce one-piece, 10-ft. tube (center). This is flattened and formed into finished blade (right).

White hot, the chrome-nickel-molybdenum steel billet is being inserted into the die container of the extrusion press for the first operation. The big press is rated at 5,500 tons.



With shank formed, the partially extruded billet is reheated, and positioned for a second run through the press. Process was perfected at Air Force Development Center, Adrian, Mich.



Tapered tube emerges from last extrusion step. Blade will now be flattened with dies that impart proper twist. Nitrogen pumped inside gives internal support during this forming step.

British Build De Luxe Rescue Boat

THIS salty-looking British rescue craft has everything—including the kitchen stove. One of several now in service along the British coast, it has many features not usually found on boats of this type.

One refinement is the enclosed deck cabin, made possible by the use of weight-saving aluminum for all superstructure, including the cabin itself, the mast, a canopy over the instrument panel, and the ventilators.

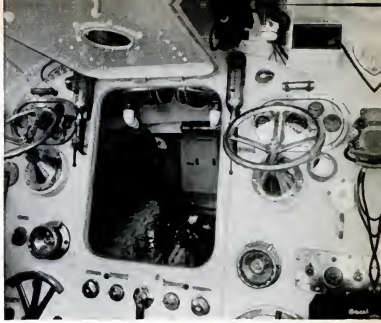
The boat is 64 feet 9 inches long, with a beam of 12 feet 9 inches. She carries a crew of eight and, even in rough weather, can carry up to 95 persons.

Two 40-hp. Diesel engines, which drive

Especially designed for coastal rescue work, the Watson cabin-type lifeboat is shown under way in British waters. The boat can carry as many as 95 persons in a rough sea, has crew of eight, can run 230 miles at top speed without refueling.

twin screws, are housed in one of nine watertight compartments.

The hollow mast serves as an engine exhaust, venting the fumes well above the heads of the crew. The lighting system is electric. She also carries a line-throwing pistol and gear that sprays oil to quiet angry waters around a ship in distress.



Instrument panel is protected by aluminum canopy. Open hatch shows engine room, one of nine watertight compartments. Engines are waterproofed, can run even if room is flooded.

Deck cabin is equipped with kerosene stove, has two-way radio in separate compartment. Below decks is another cabin with electric fans for ventilation. Benches seat 11 persons.

Equipped for duty, with crew and gear aboard, the boat weighs 22½ tons. It is either launched down a slipway or lies afloat. Boat has top speed of 8¼ knots, carries fuel for 230 miles.

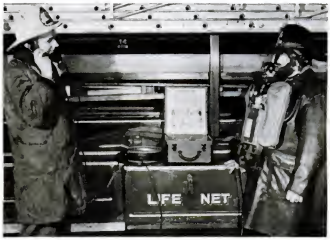
Giant Plow Helps Grow Cotton

Uprooting mesquite and black brush, one of the largest plows ever built is transforming almost worthless uncleared land near Corpus Christi, Tex., into cotton-growing land worth $300 an acre. Its 10-foot-wide plowshare, in foreground above, is mounted at the rear of a powerful tractor. A bulldozer blade at the front breaks down heavy growth, and a steel canopy protects the operator from falling trees. Traveling at two m.p.h., the plow goes 22 to 26 inches deep, and clears 20 acres daily. A smaller tractor collects uprooted brush for burning.

New Phone Links Fire Fighters

Masked firemen and their chief get two-way communication with the sound-powered Maskfone (right), developed by Mine Safety Appliances Co., Pittsburgh. Using a headset for listening, a fireman speaks into a diaphragm built into an oxygen or gas mask.

Powered by sound vibrations, the phone needs no separate power supply. It proved itself during a fire atop a Pittsburgh building. Without it, firemen would have had to descend 21 flights to report or get orders.



Economical Three-Wheel Truck from Germany May Set New Style

Something new in trucks is this three-wheeled Tempo, made in Hamburg, Germany, and just introduced in the U. S. Its maker claims it gets 35 miles on a gallon of gas-oil mixture, and carries a substantial load at 45 m.p.h. The economical one-ton machine has four speeds forward and one reverse, with chain drive direct to the front wheel (left below). It has a 400 c.c. (24.41 cu. in.) water-cooled Ilo two-cycle engine mounted integrally with the front wheel—the engine turns with the wheel. A gearshift lever extends from the dash; other controls are standard.

Scientific Torture Makes Your Home Safer

Rough-housing kids or careless housewives can't easily hurt a product toughened by torture in Underwriters' Labs.

By Allen Raymond

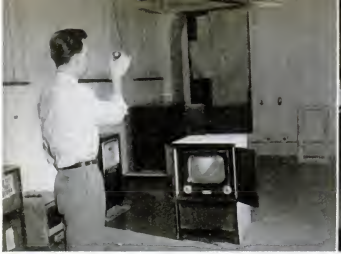
PS PHOTOS BY W. W. MORRIS

IF A budding DiMaggio, practicing his swing in the living room, accidentally whams your TV screen with a baseball bat—and nothing happens—you're not just lucky. You can be pretty sure the prototype of the set's safety mask, before it ever went on the market, proved its ruggedness by standing up undamaged under a blow of five foot-pounds from a steel ball.

Banging television sets across the screen with steel balls is only one of the scientific tortures to which household appliances are subjected by engineers of the Underwriters' Laboratories, Inc., to make sure they can take far rougher treatment than they are likely to get in normal use. Safety improvements based on those tests are reducing the risks of modern living for practically every man, woman, and child in the country.

Four hundred thousand products have been submitted for testing to Underwriters' Laboratories—in Chicago, New York, and San Francisco—by more than 6,000 manu-

Electric flatiron is dropped on the floor at Underwriters' Laboratories to see whether a jolt affects thermostat that opens and closes automatically to keep iron at a safe heat.



Glass or plastic safety mask on TV set is tested for shatter-resistance by letting a 2-inch steel ball, hung from the ceiling, swing against it three times from 51 inches away.

Extension cords, held taut by weights, are twisted and untwisted 3,000 times to make sure the insulation won't break down, exposing the wire and creating danger of fire or shock.

facturers in the 56 years of the organization's existence. More than half of those products are stronger and safer than they otherwise would have been: for more than half the 400,000, having failed under initial testing, have then been redesigned, retested, and approved.

Beyond testing, representatives of the laboratories have conferred over the years with manufacturers in setting up safety standards for all kinds of equipment, and have compiled those standards as reference works for the use of industry and government. Many local governmental agencies now require that such things as building materials, electrical wiring, and heating equipment meet the tests imposed by U. L. engineers.

The list of goods tested, and later periodically inspected, by Underwriters' Laboratories, is so broad that most of us use many of them daily without knowing of the meticulous effort that has gone into making them safe. On some, of course, there is the familiar and respected "U. L." label; but on many there isn't. They include such diverse items as baby incubators and static eliminators, electric shavers and acetylene torches, matches and fire extinguishers, window-cleaners' belts and fire-retarding windows, lightning rods and the gasoline pumps installed at filling stations.

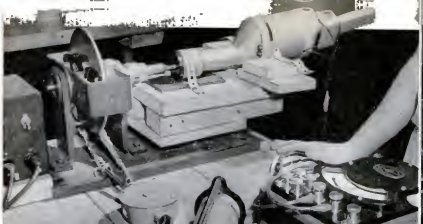
No Such Thing as "Fireproof"

Among the U. L. engineers I talked with recently in their big Chicago laboratories there is a general air of cautious conservatism in discussing their work. They shudder at talk of "fireproof" buildings or materials or of "burglar-proof" safes and bank vaults. They bear down heavily on the word "resistant" in discussing safety against hazards. Strong-boxes for valuables are "thief-resistant" within certain limits, but never "thief-proof." Tiles, flooring, doors, and the like are "fire-resistant" up to a certain point; they are never "fireproof."

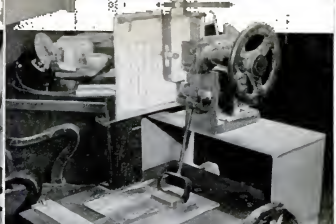
A typical U. L. test for an office safe is to

Cooking range is checked for fire hazards by thermocouples attached to 20 points on stove. With oven and burners on, tester notes whether temperature anywhere exceeds the safety limit.

Washing-machine wringer is tested by pressing on safety release with a spring gauge. Rollers must snap open at a push of no more than 20 lb. or wringer is not held to be safe for use.



Electric drills are strapped down and run for long periods against work loads simulated by a dynamometer to see whether they overheat and how their insulating material stands up.



Nonskid floor wax is tried out by noting at what angle a leather-shod mechanical leg slips on a waxed surface when it is moved gradually outward under a heavy vertical weight.

drop it off a three-story building onto a pile of bricks, apply flame up to 1,000° F. to its steel walls, assault it for certain periods of time with electric drills and blow torches. If it passes, the engineers can guarantee that it can take abuse far greater than it is likely to run up against at the hands of skilled cracksmen; that, up to some definite degree of heat, records left in it will not be so scorched by outer flames as to be illegible.

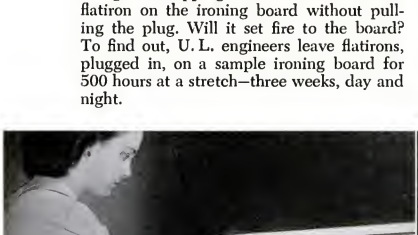
A standard practice of Underwriters' Laboratories in testing household appliances is to subject them to strains five times as great as may be expected in normal use. Carelessness by householders in the use of appliances is assumed to be normal.

Occasionally, they figure, Mrs. Doakes will go off shopping and leave her automatic flatiron on the ironing board without pulling the plug. Will it set fire to the board? To find out, U. L. engineers leave flatirons, plugged in, on a sample ironing board for 500 hours at a stretch—three weeks, day and night.

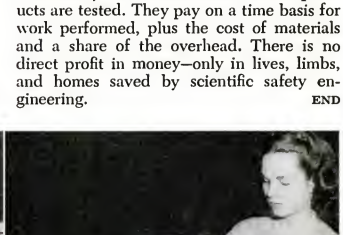
The board will be charred. But if it doesn't blaze, that brand of automatic iron is considered reasonably safe from fire hazard even in the home of careless Mrs. Doakes.

The function of the Underwriters' Laboratories is not to say which particular household appliance or industrial product is better in competition with another. Practically all gadgets of nationally known brands are now on its approved lists. Its real function, rather, is to help manufacturers set and maintain high standards of safety.

Originally the laboratories were supported by the National Board of Fire Underwriters, an insurance organization, which is still a sponsor. Today the entire cost of their work is borne by the manufacturers whose products are tested. They pay on a time basis for work performed, plus the cost of materials and a share of the overhead. There is no direct profit in money—only in lives, limbs, and homes saved by scientific safety engineering. END



Pressure cooker is subjected to steam pressure of 100 lb. per sq. in., five times what it's likely to face in normal use. Pot must have lid that stays locked on under pressure.



Fan-type heater is hooked up and tipped forward against a net of cheesecloth to see whether it might set fire to curtains accidentally brushed against it while in operation.

World's Biggest TV Studio

IT COST $1,000,000, but Radio City's huge Studio 8-H has now been converted into the world's biggest and fanciest television studio. It is three stories high, 76 feet wide, and 130 feet long, accommodating several sets, six cameras—including one in an "island" hung from the ceiling—and 1,000 lights.

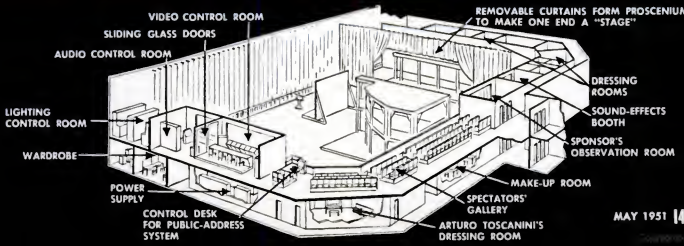
DRAWINGS BY RAY PIOCH

ALL LIGHTS SWITCHED AND DIMMED FROM CONTROL ROOM

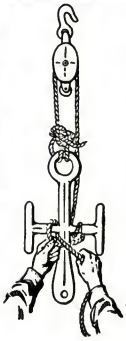
SPECTATORS' GALLERY

MICROPHONES

BIG CAMERA CRANE



Inventor Lopez lowers his bosun's chair safely and easily just by loosening one loop of rope on the combination cleat-shackle he developed. The chair itself and the safety belt are also new types he has devised.



Cleat Stops Scaffold Accidents

SERAFIN G. LOPEZ, a sailor himself, knows how hard and dangerous it is to raise and lower a bosun's chair when you're sitting in it.

So he developed a combination cleat and shackle that always holds the chair safely, and yet will move easily when the rope is loosened (as shown in the drawing at left). The free end of the rope need not be knotted and unknotted every time the chair is moved, as is done now. In case the rope slips out of the worker's hand, it tightens itself on the cleat, preventing accidents. The shackle-cleat can also be used on painter's scaffolds, as shown in the photo above.

Sound Waves Wash Clothes

WASHERS that shake the dirt right out of the clothes with powerful sound waves (PS, Oct. '46, p. 75) are now being made in Germany. This portable model weighs seven pounds, works in any kind of tub, and is said to finish a load in five minutes.

Glow Tape Marks Blackout Shipments

ALTHOUGH it's nearly dark in this warehouse, the truckman below has no trouble finding his packages. They glow. Luminescent tape, protected by coatings made with Goodrich Geon resin, does it. Century Coating Co., Whitestone, N. Y., makes the tapes.

Radar eyes are hidden behind plastic nose. Huge air scoops feed twin turbojets. Tricycle landing gear has dual wheels under fuselage and one folding into each wing.

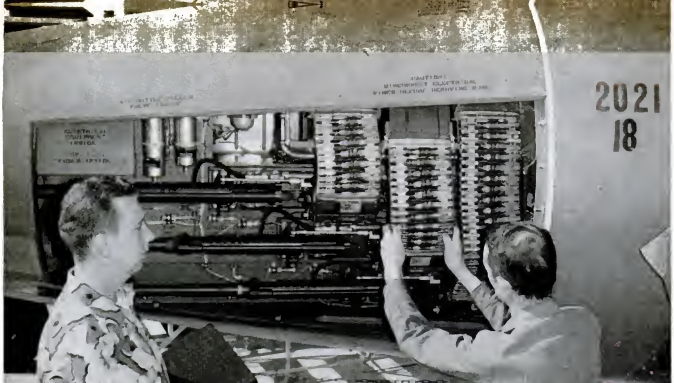
Scorpion *STINGS* at 700 M.P.H.

Twin jets power this Air Force interceptor equipped with radar "feelers" to seek out its prey for the kill.

HERE is the plane our Air Force is putting its money on to defend continental U.S.A. against A-bombers coming in high and fast, by day or night, in any kind of weather: the Northrop F-89 Scorpion interceptor.

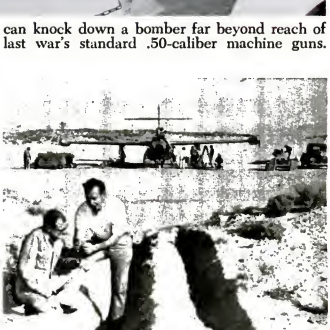
Its stinger is a battery of six 20-mm. cannon, and its feelers are radar and electronic computers for navigation, spotting targets, and training its guns.

The Air Force officially describes the F-89 as an airplane "in the 600-mile-an-hour class." Reliable reports say it cruises at 535 m.p.h. and has a top speed of 706. Its two souped-up Allison turbojet engines boost the 15-ton interceptor to its service



Belts of 20-mm. ammo feed three fast-firing cannon nested on each side of the nose. They can knock down a bomber far beyond reach of last war's standard .50-caliber machine guns.

Smoky cloud leaps up as Scorpion looses its full fury against a sand dune at Edwards Air Base in California desert. Guns operate off the plane's electrical system or a battery.



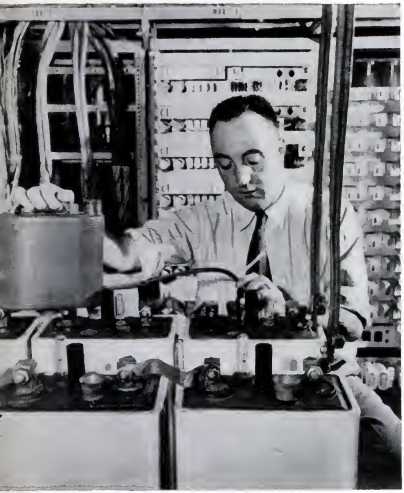
Blast from six guns cut these trenches in the sand. View of plane in background shows its thin wings, thick body, and the upswept tail that gives the deadly Scorpion its name.

ceiling of 10 miles in a matter of minutes.

Northrop engineers credit the plane's sensational performance in part to its broad, ultra-thin wing. Though it has only a 5° sweep, the power demand on the engines is no greater than that of a similar wing of 20° sweep. Decelerons on the trailing edges combine the jobs of flaps, ailerons, and air brakes to provide all controls but a rudder.

Air Secretary Finletter recently called the big aerial destroyer our "basic defense aircraft." Test-flown last year, it has been coming off production lines at Hawthorne, Calif., in quantity since January. By summer, squadrons of Scorpions will be in service to guard high-priority targets. END

New Telephone Battery Works Better, Lasts Longer

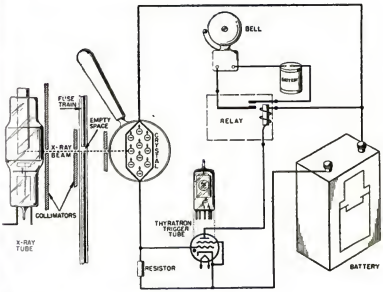


Because telephone engineers found a sniff of strange gas near a switchboard room, the Bell System is getting a new kind of storage battery. It will last 50 percent longer, run many more months without extra water, and hold its charge five times better than older types. It promises to save the phone company $1,000,000 a year.

The strange gas in the story was stibine. The engineers, searching for the cause of a tarnish on dial switches, traced the stibine to the storage batteries kept by switchboards for emergency power. It was being formed from antimony mixed with the lead in the batteries as a hardening agent. More research showed that stibine had nothing to do with the switch tarnish, but did have a lot to do with lowering the efficiency of the batteries. By using calcium instead of antimony to harden the lead, stibine is eliminated and the better battery results.

The new battery, already in production, is designed specifically for telephone use. What about automobiles? Bell scientists won't say yes or no. But this battery is the same general type as a car battery. The rest is up to the industry and the public.

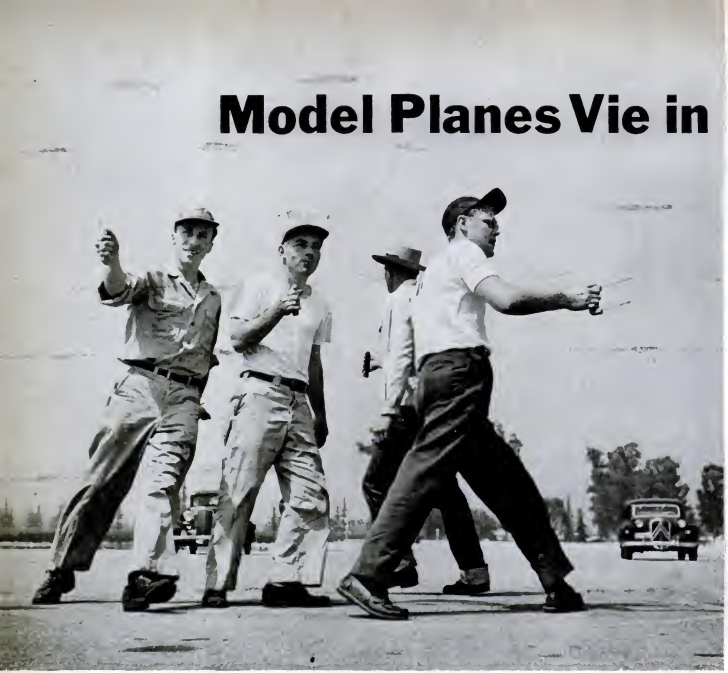
X-Ray Tester Gets Electric Eye to Speed Inspection



Electric-eye inspection, already used to count pills and discard green oranges, can now even examine what's inside a product. A new kind of electric eye—a crystal sensitive to X rays—makes this possible. Test setups have already gauged the fullness of cans of foods (photo at left above) and spotted empty spaces in blasting fuses (right).

The crystals used are cadmium sulfide, "grown" by Drs. Rudolf Frerichs, of Northwestern University, and John E. Jacobs, of the General Electric X-Ray Corp. When struck by X rays passing through the product, they generate a current, just as ordinary photocells do when struck by light, and thus work an inspection signal.

Model Planes Vie in



Dodging each other takes nimble footwork as model-plane pilots, keeping within circle of 10-foot diameter, race their craft around circular course on 60-foot tethers of piano wire.

Whirling dervishes fly up to six entries at once in the most exciting kind of miniature speed contest yet devised.

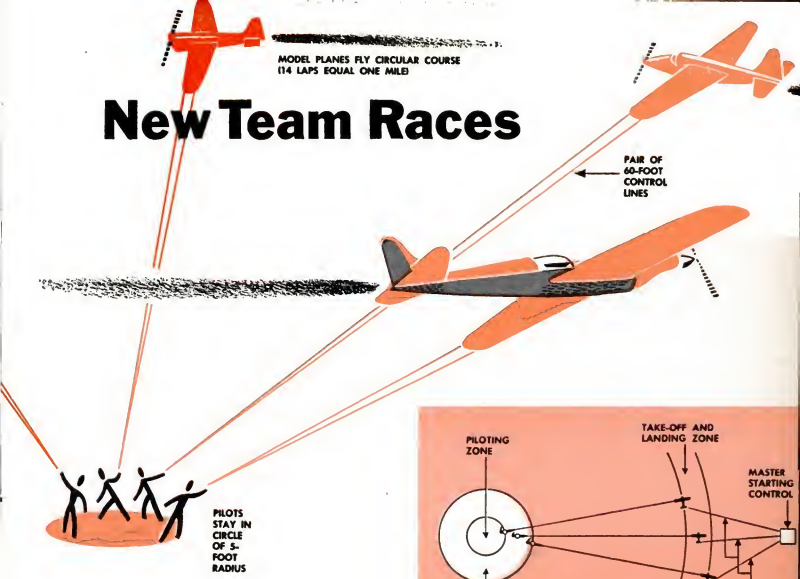
By Andrew R. Boone

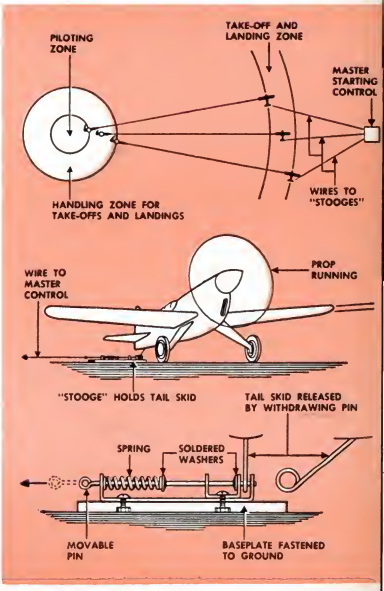
YOU see several grown men wheel round and round inside a 10-foot circle. One lifts his hands high, and another ducks beneath them. Every three seconds the group dogtrots around the circuit, in a scramble that continues until 140 turns have been completed.

They're racing model airplanes. At the end of twin piano wires they hold with U-shaped handles, nifty little buzz-ships whip around a wide circle at 80 m.p.h. in a 10-mile race. After eight minutes or so, the whirling dervishes zoom their planes into a sharp climb. Props stop, and the

Prop kicks up gale as miniature plane awaits start of race. Using syringe, Keith Storey keeps its tiny fuel tank brimful, so plane will carry every precious drop permitted by rules.

New Team Races





Exciting speed contests now pit buzzing model planes directly against each other in air, instead of flying and clocking one craft at a time. Control lines hold planes on circular course, cause them to climb or descend, and cut off engines to make them glide to a landing.

Take-off zone is cleared, judge gives signal, and starter trips this spring-loaded trigger. Wires operate "stooge" releases, setting planes free. They're airborne after about 15-foot run.

Starting line-up (top) is between outer two of four concentric circles marked on flight area, with radius of 5, 15, 65, and 75 feet. Each plane is held by tail skid on "stooge" or mechanical release (center and bottom). Master control releases all planes simultaneously.

Fuel tank of one-fluid-ounce capacity is largest permitted by official rules. Judges check entries, as above, by draining contents of full tank into graduated measuring cylinder.

Flight box beside plane being fueled is owner's portable service station. Usual contents include tools, spare parts, fuel, and dry cell, hooked up as shown to heat engine's glow plug.

planes glide down to landings. Then the perspiring and dizzy pilots make for the nearest place to sit down.

This new kind of racing is the most exciting contest yet cooked up by model-plane fans. Formerly competing speedsters flew singly, in individual runs against the clock. Now as many as six racing planes may take the air at once, to vie directly with each other. Mechanical starters loose them simultaneously. Timers count their completed laps, and the first one to finish the required number is the winner.

Pilot and mechanic form a team to race each entry. In a 10-mile race, a plane may land three or four times to refuel. Then the team works fast to squirt fuel into the one-ounce tank, spin the prop, and get the ship airborne again. To date, the record is 14 seconds from landing to take-off.

Rules specify a maximum racing altitude of 25 feet. A plane may pass either over or under one it overtakes. Its pilot must tell the overtaken pilot which he is going to do. The 60-foot control lines serve not only to guide the planes in a circle, but also to maneuver them. The twin wires enter a plane's wingtip side by side, and work its elevators through a bell crank to which they are attached. Tugging one strand or the other makes the plane climb or descend.

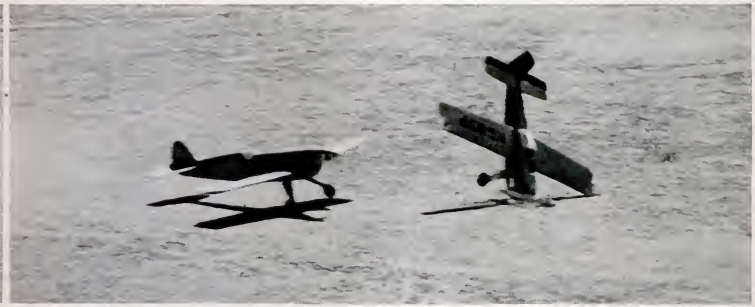
Glow plug is tightened with spark-plug wrench. End of cylinder, projecting through bottom of plane, will be covered by streamlined fairing when model plane has been readied for race.

A spring plunger shutting off the fuel supply and engine is tripped when the elevator control is moved to extreme "up" position.

Planes needn't be scale models but must resemble full-scale racers. Wing area must be at least 125 sq. in., and engine displacement between .201 and .300 cu. in. These single-cylinder, two-cycle engines deliver ½ to ¾ hp. at 18,000 r.p.m. Standard fuel is

Motors that balk at starting when prop is spun by hand get an assist from cart holding auto battery and starter motor. Rubber-hose fitting grips spinner and whirls model engine to life.

Checkered flag signals finish by each plane. Green flag starts race; red one flags planes down; and yellow one, when plane lands to refuel, warns others to keep clear of ground.



Crashes are frequent, usually immediately after take-off. Above, leading plane comes to grief, and following one is about to pile into it. To minimize such tangles, rules provide starting line-up in order of getaway speed shown in preliminary trials, with fastest-accelerating plane in leading place; and plenty of headway, as shown in a preceding diagram.

a mixture of methanol and castor oil with nitrated elements added. For realism, every plane must carry a "pilot" fashioned to 1/10 scale.

Called "control-line team racing," the new sport dates from a meet at Burbank, Calif., some months ago, when a group of Pasadena enthusiasts tried a three-plane jump-off. Last year, for the first time, it was included in the national meet at Dallas, Tex., and Don Post, of Glen Rock, N. J., became the first national champion. Now model clubs all over the country are scheduling similar races. The Academy of Model Aeronautics official rules have been taken directly from those of the F.A.S.T.—"First All-Speed Team" club—the original Pasadena group. END

Neither the view—nor the precipitous drop—behind him seems to interest engineer supervising final adjustments to Rio's TV antenna.

Transmitter for first television station in Rio de Janeiro is barely visible atop Sugar Loaf mountain (top center in photo above).

Cable car, normally reserved for tourists, carried much video equipment up 1,300-foot Sugar Loaf, which cannot be reached by truck.

Rio Gets Mountain-Top TV

THE highest place gives the longest range to a TV transmitter. In Rio de Janeiro, Brazil, that meant the top of famous Sugar Loaf mountain, which dominates the South American city and its magnificent harbor. And that is just where the antenna for TUPI-TV was placed by General Electric engineers—even though all the equipment had to be hauled up by hand, mules, or cable car. Brazil has one other station (in Sao Paulo) and several thousand receivers.

British TV Goes Up and Down

NOTICE anything strange about these TV antennas? That's their British accent showing. The dipole arms are vertical because British stations transmit waves vibrating vertically. Our TV uses horizontal polarization, calling for horizontal aerials.

Electronic Sergeant Recruits GIs

THE recruiting sergeant has gone electronic. As soon as a prospect steps on a mat outside the Armed Forces booth in New York's Times Square, an automatic tape player (above) spiels the advantages of enlisting. General Electric made the device.

Army Crates Get Tough Going-Over

Revolving drum does a job on a crate for a crankshaft weighing several hundred pounds. At left, box has cover torn off and steel bands broken. But crankshaft is unharmed.

In incline-impact test, the crate on dolly above will be sent rolling down 40 feet of rails to smack against bottom wall at speed of 8 m.p.h.

Poorly made crate (below), after having run the gantlet, ends up a mess. Contents, which might have been rifles, would have been ruined.

INSIDE the huge revolving steel drum above, packages in which war materials will be shipped take a beating to test their toughness.

This and other equally grueling tests are part of the work of the Engineer Research and Development Labs at Fort Belvoir, Va. Here the Army gets the low-down on various types of containers before using them to ship valuable supplies to the frozen wastes of the Arctic or the torrid hot-boxes of the tropics.

A vibration stand subjects crates to a terrific shaking such as they have to take in a railroad freight car or on a truck journey over rough roads. A giant ceiling-high press squeezes containers with a load up to 100 tons.

Besides being rugged, crates and packages must be able to protect contents from deterioration due to rust, sleet, cold, or heat. To pass, they must come through immersion in a water tank and prove their ability to withstand the man-made rigors of Arctic and tropic climatic chambers.

In early years of World War II less than half the material shipped overseas arrived in usable condition. The project has halved this loss—but the Engineers' goal is 95 to 100 percent safe arrival.

Pneumatic Hand Saw Won't Kick or Grab

THIS pneumatic hand saw works like those teeth-jarring air hammers you've seen digging up streets. One big difference, though, is that it has two 21-inch blades side by side, so arranged that one moves backward as the other moves forward. It makes 1,500 strokes a minute, but because of opposed action will not grab or kick.

Compressed air pushes forward a semi-cylindrical piston attached to one blade. As this blade moves forward, its motion is reversed by a rack and pinion and transferred to the second blade, moving it backward. At the end of the stroke, a cam trips a shuttle valve that closes air to the first piston and opens it to a piston attached to the second blade. This drives the second blade forward and the first blade backward.

The 15-pound saw will cut to any depth with a 3/16-inch kerf. Wright Power Saw and Tool Corp., Stratford, Conn., makes it.

Keeping the Home Shipshape

Pry off the metal spine before discarding a loose-leaf book, and mount it on a cellar wall. Its rings will hold instruction sheets for your oil burner, washing machine, and power tools.

To make low fences for flower beds, bend wire hangers to a diamond shape. Stick straightened hooks into ground, and wire together adjoining points for added strength.

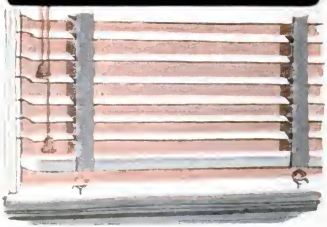
To repair a plastic hose with a hose mender, first soften the end of the hose by immersing it in very hot water. Use a mender slightly larger in diameter than the inside of the hose.

Steep or narrow attic and cellar stairs can be dangerous. Fix several screen-door handles along the way for handholds and ascending and descending will be easier and safer.

To fasten brackets to concrete walls, drill holes with a star or carbide-tipped drill, fill with plastic composition wood, and let dry. Common wood screws will hold firmly.

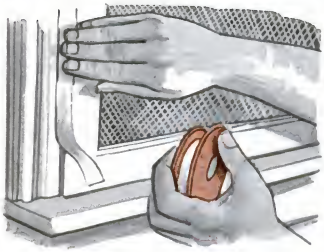
Please turn the page for five more suggestions.

Keeping the Home Shipshape



Do your Venetian blinds rattle and bang when windows are left open? Cup hooks and screw eyes between the bottom of the blinds and the sill will stop this.

To remove drip stains from asbestos shingles, use one cup of trisodium phosphate powder in a pail of hot water. Scrub thoroughly and rinse with clean water and a sponge.



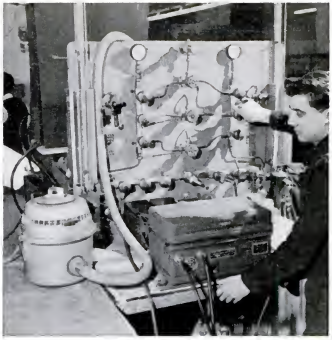
To keep insects from crawling into the house between window frame and screen, seal cracks shut with white surgical tape. It adheres well and matches white woodwork.

Ordinary shoe trees won't work in women's strap-back shoes. But if you alter the heel knob as shown, the strap will fit in it securely and the shoe can be kept in shape.

A long carriage bolt, inserted through a bit of pipe and a washer, and then driven in the ground, makes a simple hose guide. It serves as a roller past which the hose pulls freely.

Rear Light Flashes Slow-Up Signal

If you were following the car above, a flashing amber light would warn you when its driver had taken his foot off the gas and was slowing down, even though he hadn't yet applied his brakes. It's equipped with an accessory called Slo-Lite, operated by a vacuum control that turns it on when the accelerator is released. It is made by Twentieth Century Mfg. Co., of Los Angeles.



Home Vacuum Tests Waterproof Radios

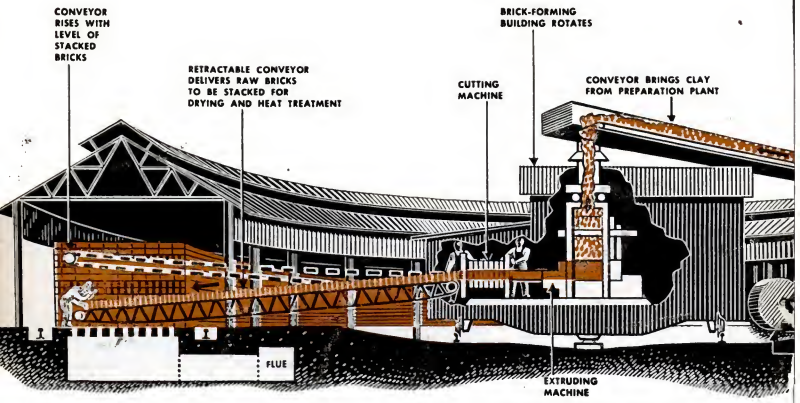
The Lewyt Corp. used to test its waterproof Signal Corps radios for leaks by dunking them in water—risking damage to valuable equipment. Now they simply hook up an ordinary household vacuum cleaner (a Lewyt, of course) to the set and pump out most of the air. If a vacuum holds inside at a specified level, the set passes. If not, the parts aren't damaged by water.

"Black Light" Illuminates Traffic Sign at Night

Shown below is a driver's night view of an unusual traffic sign near River Grove, Illinois. Painted with new fluorescent pigments, it looks like a conventional road marker in the daytime. But at night invisible ultraviolet rays from the lamps above the sign cause the letters to produce a penetrating glow visible for 200 yards.

Making Bricks on a Merry-Go-Round

Circular brick factory looks like this from air. Clay dug nearby, and ground up and freed of rocks by preparation plant in right background, rides conveyor to building at center of ring.



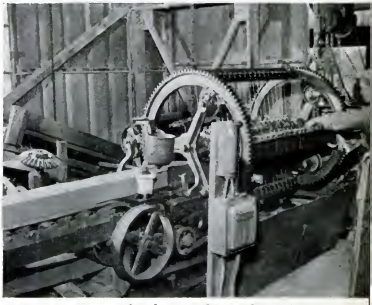
Raw bricks are made in central building, which revolves and delivers them by conveyor to each sector of ring for stacking and drying. Meanwhile, kilns of inverted-U shape are pulled by tractor around circle, baking stacks already dried. Result is assembly-line production. Photos of

Machinery travels in circles and a two-story building revolves to apply assembly-line methods in ring-shaped factory.

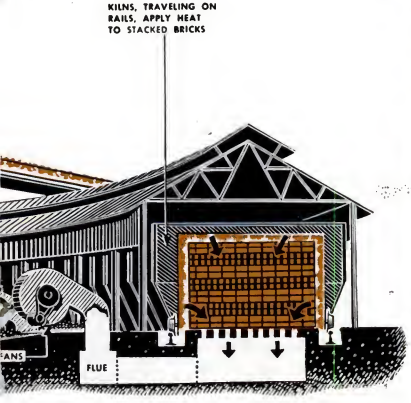
BELIEVED unique among the nation's 1,250 building-brick factories, a merry-go-round plant at Muirkirk, Md., has operated for 13 years almost unnoticed, since its odd design is conspicuous only from airplanes. In a ring-shaped structure of 140-foot overall diameter, traveling kilns ride a circular track to bake raw bricks to final hardness. A revolving two-story inner building forms the raw bricks from clay, and delivers them on a conveyor to any part of the ring.

Standard brickmaking machinery has been adapted to the circular assembly-line procedure. Mixed with water by the rotating knives of a pugmill, clay emerges from the extruding machine like toothpaste from a tube, and wires slice it into raw bricks. Heating in kilns serves to fuse minerals called fluxes in the clay, imparting rocklike hardness. Red bricks owe their color to oxide of iron, another common clay ingredient. At the Muirkirk plant, the Washington Brick Company produces 90,000 smooth red and textured bricks daily, selling most to contractors within 50 miles. END

Lower conveyor of central building retracts to clear roof columns as building revolves. Then it extends to deliver raw bricks to workers, who stack them in piles as at left.

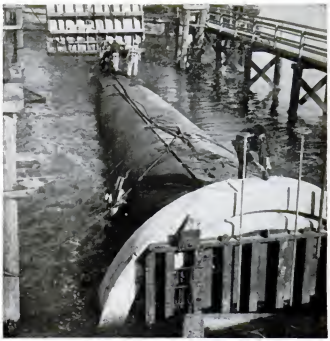


Just as wires in kitchen gadgets slice cheese or hard-boiled eggs, big cutter uses wires to slice raw bricks from a column of moist and plastic clay, seen entering from lower left.



plant and data for text and drawing are from *Esso Oilways*, a publication of Esso Standard Oil Company, whose fuel oil heats kilns.

Traveling kilns (beneath roof) heat bricks 21 hours at 2,000°F. to harden them. Leftover hot air, blown through flues, dries and preheats bricks that await firing elsewhere in circle.

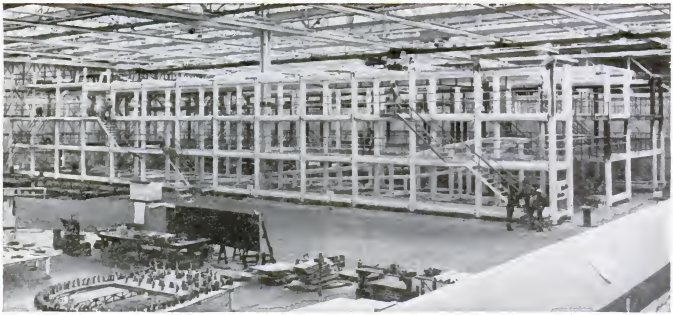


Big Pipes Sail to Work

San Franciscans saw strange craft sailing in their bay recently. They were 480-ton pipes as big as boxcars. Each was a section of a pair of intake tubes that will carry cooling water 400 feet from the bay to a new Pacific Gas and Electric steam plant on shore. Bechtel Corp. engineers cast the concrete pipes on land, floated them to the right spot, and then opened valves to sink them into position.

Steel Ball Stores Rocket Fuel

It took nearly a ton of welding rod alone to make this tank for rocket fuel. The tank must hold 200 gallons of liquid nitrogen—at a pressure of 5,500 pounds per square inch and a temperature of 340° below zero. Six extra-thick stainless-steel plates, pressed to the curved shape assumed by the faces of a blown-up cube, form the big ball. Research Welding and Engineering, South Gate, Calif., made the "Nitro-Sphere" tank.



Indoor Drydock Cradles Two Big R3Y-1 Flying Boats

This maze of steel pipe four stories high is an indoor drydock for giant flying boats. Engineers call it a twin-hull buck. It holds two R3Y-1 turboprop planes during assembly at the Convair plant in San Diego. Although the huge jig weighs about 1,000,000 pounds and contains 8,600 feet of 12-inch pipe, plus hundreds of feet of smaller pipe, it can be taken apart and reassembled in another location in a few days.

In stacking, scraped dishes are placed with soiled sides facing cleaning vane. Transparent glass cover locks automatically. Center rack holds silverware.

Slowly revolving vane throws wave after wave of hot water against dishes in a brushlike action.

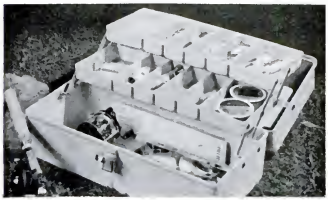
Portable Dishwasher Uses Water Like Brush

THE new James automatic dishwasher cleans by cascading a swirling two-foot-long wall of hot, sudsy water over its contents.

Hot water from a top spray first rinses dishes, then falls to the bottom where it is filtered clean again. A rotating vane then hurls waves of water against the dishes like a whirling brush. Two top sprays and two power rinses follow. The lid opens automatically to allow steam to escape to start drying. The machine uses only five gallons but recirculates them so that the dishes actually receive 500. Dale Distributing Co., of N. Y. City, sells the wheeled washer.

Steam Bomb Sprays Insecticide

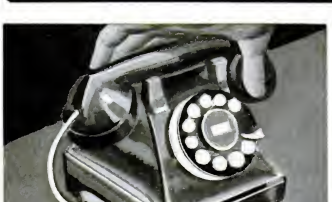
THE new aerosol insecticide bomb above spreads DDT and chlordane crystals in a thick cloud of steam vapor and inert gases generated by dry chemicals. Set off by pulling a small tab, the cardboard Dispercide bomb is under no pressure when not in use and thus needs no metal container. Yosemite Chemical Co., San Francisco, makes it.



Fishing-Tackle Box Made of Glass

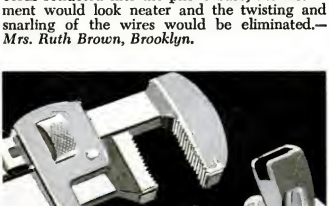
HERE'S a rugged fishing-tackle box that is said to be rustproof, permanently colored, and almost impossible to dent or damage. It's made entirely of Fiberglas, except for the rustproof hardware. The roomy Neptune has two cantilever trays and weighs five pounds. The Hamilton Metal Products Co., of Hamilton, Ohio, sells it for $17.95.

I'd like to see them make...



Telephones with retractable cords. If the cords retracted into the phone base, the instrument would look neater and the twisting and snarling of the wires would be eliminated.—*Mrs. Ruth Brown, Brooklyn.*

Paint brushes with holes drilled in the handles. When suspending brushes in paint or thinner, choice of holes would allow brush to be held high enough to keep it from resting on bristles. —*C. D. Brown, S. Miami, Fla.*



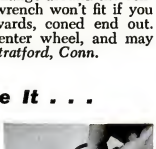
Removable rubber pads to fit over the jaws of regular pipe wrenches. Attach the pads and the wrench could be used on chromium-plated fixtures without danger of marring the finish. —*W. L. Peters, Kansas City, Kan.*

Auto wheel nuts with a flange around the centering-cone side. Then wrench won't fit if you try to install nut backwards, coned end out. A reversed nut won't center wheel, and may work off.—*J. C. Ropes, Stratford, Conn.*

A lid for electric-mixer bowls to prevent spattering. It could be made of plastic and slotted for beater shank to pass through. One large size would cover large or small bowls.—*Mrs. F. V. Winfrey, Williamsburg, W. Va.*

NOW They Make It . . .

Tire patches with tabs on the fabric separators that cover the sticky surface, suggested in Jan. '51 PS. Made by the Ace Rubber Co., Dallas, Texas, and the H. B. Egan Mfg. Co., Muskogee, Okla.



Everyone has his own pet idea of some gadget he would like to see in general use. What is YOURS? *Popular Science* will pay $5.00 for each one published. Use government postcards only. Contributions cannot be acknowledged or returned.

MECHANICS
and
HANDICRAFT
REG. U. S. PAT. OFF.

Papering a Room

from A to Z

These are the tools you need. Photos on the next five pages show you how to use them.

Putting up wallpaper yourself cuts the cost of redecorating —and it's not so hard to do, once you learn the hang of it.

By Bernard Gladstone

PS PHOTOS BY W. W. MORRIS

I HAVE just saved $65 by repapering a hall, bedroom, and bathroom myself. There are tricks to hanging wallpaper, but these photos will show you most of them.

Preparing a wall. Fill cracks and holes with spackling putty and sand rough spots. If the surface has water-soluble paint on it—such as calcimine—wash it off. Wallpaper will not stick well over water paint.

If the walls have a high-gloss paint on them, wash them with one part ammonia and four parts of water to dull the gloss. Then give the surface a coat of glue size.

Lining paper—a plain paper that goes underneath and keeps wallpaper from pulling apart at the seams—should be put up first if you intend to hang paper directly on fresh plaster. You don't have to use lining paper, however, when you paper

Measure wall from baseboard to ceiling and add 5" for waste. Then subtract the length of your table and mark the difference on the table. (In this case, it was 20".) You then can roll out a strip as long as the table and use the mark on the table to add the amount needed to cut strips the right length.

Determine how many single rolls you will need by finding how many square feet must be covered and dividing that figure by 30. Deduct one single roll for every three standard windows and every two standard doorways. Then tear off paper as shown, after first creasing where each strip ends.

Continue spreading paste until you've covered about 4' or 5' of the strip. Then pick up the pasted end by the corners, using your thumbs and forefingers as shown in this photo, and raise the end straight up.

Fold the pasted part back on itself as far as the pasted area extends. Smooth out any wrinkles. Slide the folded part sideways to line up the edges exactly. Then slide the folded part toward the end of the table to bring all of the unpasted part of the strip up on the table.

over old wallpaper. Be sure the old paper is tight. If it isn't or if there are several layers, apply hot water and scrape it off.

Incidentally, most wallpaper is sold in double rolls to save waste, but don't let this confuse you. You'll figure in single rolls, and if you need an odd number, your dealer will cut apart a double roll.

Tools. Those you will need are shown on the first page of this story. Many wallpaper stores will rent you the tools. A 3′ by 8′ sheet of plywood topped with Masonite and laid on saw horses makes a table.

Joints. You have a choice of three kinds of seam. For a lap joint, trim only one edge of the paper and overlap it about ¼″ over the strip previously hung. For a wire-edge joint, do the same with about a 1/16″ overlap. For a butt joint, follow the instructions given with the photographs. A butt joint looks much better and is only a little harder.

If you use a lap joint, start hanging paper from the lighted side of the room. Then the lapped joints won't cast shadows.

Corner cutting. Measure the distance between the last strip and the corner. Trim the next strip to this width plus 1″. Hang this strip, folding 1″ around the corner.

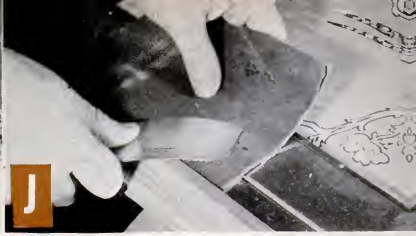
Tie a cord across the top of your paste bucket. It will serve as a rest for the paste brush. Mix your paste according to the directions on the package. Stir it until it is smooth, creamy, and free of lumps. Then set the bucket on a box or stool near the end of the table to avoid bending.

Square one end and an edge of the paper with a side and an end of the table. Spread the paste on evenly from right to left and from the center to the edges. Avoid running paste onto the table where it will smear the pattern. Keep a damp rag handy, and wipe off the table immediately whenever you get any paste on it.

Apply paste to the rest of the strip and fold it back on itself as you did the first part of the strip. Bring this end down to meet the other end of the strip. Having a good table helps; you can rent one in many communities.

Bring the ends of the folded parts together evenly. Then line up the edges of the folds with each other. The edges of the folds must be lined up exactly so the edges of the strip will be straight after trimming. Smooth out wrinkles or bubbles. [*Continued on next page.*]

Lay your straightedge along the edge of the folded strip. Line up the straightedge with the trim marks on the paper. If there are no trim marks, measure the distance from the edge of the paper to the straightedge at each end of the strip. The straightedge must be parallel to the edges of the paper.



Make sure your trimming knife is sharp. Keep a piece of fine emery cloth handy. Sharpen the knife on the cloth after you have trimmed every three or four strips of wallpaper. And keep a carton beneath the table into which you can throw wet trimmings.

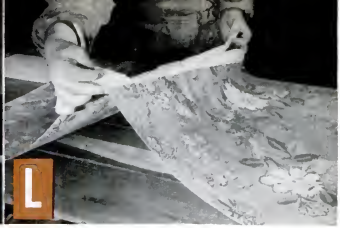
Mount your stepladder carefully, holding the strip only by the corners and supporting it with the other fingers just as you picked it up. Hang the first strip in an inconspicuous corner or next to a door or window, where a mismatch when you finish will be less noticeable.

Place the top edge of the paper on the wall where it meets the ceiling. While still holding the top edge with thumbs and forefingers, let go with the other fingers. The lower part of the strip will drop. Catch it with your foot so the sudden jerk doesn't tear the wet paper. The bottom part will remain folded.

Unfold the lower fold after you have worked down to it with the smoothing brush. Reach under the fold, grasp the edge, and peel it down. With the lower fold opened, finish smoothing the strip all the way down to the baseboard.

Plumbing the first strip comes next. This is important. Frequently the starting point—a window or door frame—is not exactly plumb. The first strip acts as a guide for the whole wall. If you find that the first strip is not plumb, place your palms on it and slide it to the left or right until it is plumb.

Press down hard on the straightedge with one hand to keep it from slipping. Hold the knife against the straightedge and keep the cutting edge perpendicular to the paper. Exert enough pressure to make the cut in one smooth stroke. Then turn the paper around on the table and trim the other edge in the same way.

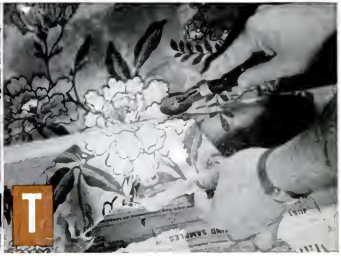


Pick up the pasted and folded strip by grasping it at the edges right at the point where the ends meet. Peel back one end slightly and hold the corners by thumbs and forefingers. Use the other fingers to support the strip. *Warning:* Make sure the corners you pick up are the top corners of the strip.

Press the top of the paper against the wall. Lap it on the ceiling or picture molding. Line up a vertical edge with a door or window frame or a corner. Lap the vertical edge on the frame or into a corner.

Start at the top and use your smoothing brush to smooth out all wrinkles and air bubbles. Work with diagonal strokes from the center out to the edges of the strip of wallpaper.

Use your smoothing brush to crease the paper sharply against the top of the baseboard. In the same way, crease the paper into corners and into the angle where walls meet ceiling.



Trim off waste by running your casing wheel along the line where baseboard meets the wall. Then trim excess at the ceiling and along door or window frames. Use a sponge to get excess paste off woodwork and the face of the paper. Clean the sponge by washing it frequently in running water. [*Continued on next page.*]

Match pattern before cutting second strip. Hold roll against strip already on wall to find point near top where pattern matches. With some patterns, you may have to waste up to half a pattern. But usually you can avoid this waste by cutting second strip from a different roll, and the third strip from the first roll, etc.

Measure off and cut the second strip. Paste and trim the strip. Start hanging it at the ceiling. Butt the edge of the second strip against the edge of the first, carefully matching the pattern as you work your way down. Take your time and slide the paper up or down to make the pattern match exactly.

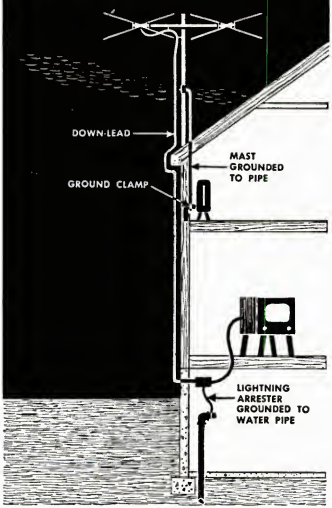
Use your seam roller after you have hung three or four strips. Start at the first seam and roll each one. Roll with long strokes and moderate pressure. If you press too hard you may cause a shiny streak to appear when the paper is dry. If the roller forces out any paste, wash it off at once with your damp sponge.

Trim around window and door frames with shears. Use the casing wheel to finish up trimming along the edges and tops of frames. Cut the short pieces for above and below windows from the same roll of wallpaper. Keep the casing wheel sharp by stroking it frequently on the emery cloth.

Hang ceiling paper first in rooms where both walls and ceilings are to be papered. Use a smooth wooden bar (a yardstick will do) to help support one end of the strip while your other hand works it into place. Allow the paper to lap the sidewalls about ½". The paper on the walls will later cover this lap.

Press one end of the strip into place and then use your smoothing brush to smooth out the rest of the strip. Roll seams and sponge off excess paste just as on walls. An amateur should not attempt a large ceiling without a helper.

Lightning vs. Television



Does the antenna endanger your home? Can you install adequate protection?

MANY POPULAR SCIENCE readers have worried about lightning since putting television antennas on the roofs of their homes. Here are their questions—and the answers:

Should lightning protection be provided when an antenna is put up?

Yes. It costs little, and is required by electrical codes in most communities.

Have many homes been damaged because of a lack of such protection?

No, possibly because TV antennas have been concentrated in cities where tall buildings act as lightning rods. Only fairly recently have TV antennas begun to appear in areas where the lightning hazard is greatest. It is difficult, moreover, to determine whether a TV antenna is responsible when lightning does strike.

Should an arrester be used on an antenna mast?

No. The mast should be well connected to a good ground. A water pipe is best.

What about the lead-in?

A lightning arrester should be used with an unshielded ribbon lead-in. When a coaxial cable or shielded down-lead is used, the arrester can be omitted and the shield grounded.

Where should the arrester be put?

At the point where the down-lead enters the house. It may be either inside or outside but should not be near any combustible material. An arrester connected at the mast end of the lead offers no protection against induced charges that hit the wire below.

What kind of arrester should I use?

A double arrester that protects both leads. If you can only get the single type, use one in each lead. Underwriters Laboratories test arresters for safety and proper performance. Look for the UL label.

Can I install an arrester myself?

Yes. Most approved TV arresters are made to fit ribbon lead-in. Just slide the wire in and tighten the screws or nuts as directed. With most types, you do not have to cut the wire or even strip the insulation. The center lead or clamp must be grounded.

Is a vent or soil pipe a good ground?

No. Neither is a fire escape. (Non-conductors are often used at the joints.) But the metal frame of a building, electrical conduit, or any underground piping system is a good ground. If necessary, you can bury metal rods or plates deep in the earth.

What size wire should be used for the ground connection?

Electrical codes specify sizes from No. 14 to No. 4. The heat generated by a lightning bolt will melt almost any wire, but the wire will do its job before it falls apart. Number 14 is adequate. It should be clamped—not looped or soldered—to the ground.

Does an arrester affect a set's operation?

Some arresters may weaken the signal in some cases. Reverse the receiver's AC power plug if this happens.

Should a set be turned off during a storm?

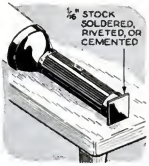
Not unless you're the nervous type. Turning it off may reduce the chances that your set will be damaged, but does not affect an antenna's vulnerability to lightning. END

Dehumidifier Reactivates Itself

THERE are no chemicals to replace, nor is there any drip pan to empty, in this new air dryer. It is designed to combat condensation and mildew in basements, "crawl spaces," and cottages closed for long periods.

Humid air is drawn past a dust filter through silica gel, where moisture is adsorbed. After 90 minutes, a valve closes the dry-air outlet, and a wet-air outlet opens. An electric heater then turns on and adsorbed moisture is discharged as warm-water vapor to the outside. After half an hour, the valve shifts back to drying position. Daly, Merritt & Sullivan, of Falls Church, Va., makes it. The $125 price includes air hose, clamps, and window panel. A humidstat controller is available.

Square End Steadies Flashlight

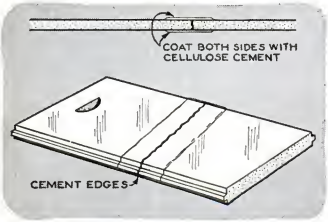


DOES your flashlight roll away from you when you lay it down? A square bit of metal on the end will curb it. If the flashlight is made of steel or brass, solder a square of 1/16" metal on the cap; if it is aluminum, attach the metal with rivets; and if the case is plastic, cement a plastic square on it, as shown in the drawing.—*Arthur Trauffer, McClelland, Iowa.*

Fancy Button Makes a Drawer Pull

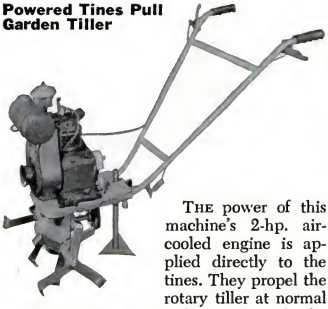
DECORATIVE old buttons make unique knobs for small drawers in cabinets or cosmetic chests. Metal buttons with a wire loop on the back are easiest to mount. Run a small cotter pin through the loop and add a piece of metal tubing for a spacer. The spacer shown here is an uncrimped metal eyelet, obtained at a shoe-repair shop. A bit of copper tubing would also serve. Push the cotter pin through the hole in the drawer front and clinch the ends on the inside, drawing button and spacer tight.

Here's a Trick that Often Helps When You Must Glue Small Pieces



WHEN a small plastic, fiber, or wooden part from some gadget breaks, and simple edge-to-edge gluing fails to repair it, try "splinting" the joint with cement. Cement the edges and let the joint harden. Coat one side of the piece, allow it to dry, and then coat the opposite side. Repeat two or three times on both sides. This forms a thin sleeve over the break. Sand the surfaces smooth. You can also splint a piece by wrapping several turns of cellulose tape around it.—*Frank Shore, New York City.*

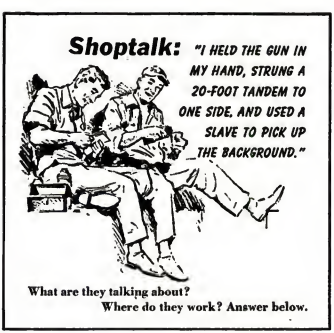
Powered Tines Pull Garden Tiller



THE power of this machine's 2-hp. air-cooled engine is applied directly to the tines. They propel the rotary tiller at normal walking speed as they pulverize the soil. The tines can be adjusted from 7" to 21" in width. They can also be replaced by two wheels to convert the machine to other uses. By the use of attachments, the Garden Maker becomes a power sprayer, water pump, weed cutter, or lawn mower. The 72-lb. tractor is made by Windolph Tractor Co., of Portland, Ore.

Faucet Washer Is Thumb Guard

WHEN I use a small file to sharpen an auger bit, I slip a large rubber faucet washer over the tang of the file. It serves as a guard and keeps me from cutting my thumb on the sharp edges of the bit.—*R. J. Addicks, New Britain, Conn.*



They're photographers. The speaker is describing a lighting setup. He held a flash gun in his hand with an extension cord (tandem) connecting the side light. He used a photoelectric unit (slave) to fire the flashbulb that lighted the background.

Nail Kegs Form Concrete Piers

A PIER-TYPE foundation for a small building can be constructed as above. Dig below frost line and pour concrete for the subfoundation. Before this sets, put a bottomless keg above it and pour the pier.

Screwdriver Makes an Offset Chisel

IF YOU need an offset chisel occasionally to cut around a corner or clean out the bottom of a mortise or groove, here's an easy, inexpensive way to make one out of an offset screwdriver. These screwdrivers are cheap, but will hold fairly good cutting edges. Saw off one end of the driver and file enough of a point so you can force it into a handle. File or grind the remaining tip to a chisel point. Touch it up frequently to keep it sharp.—*Charles Smith, Jacksonville, Fla.*

How to Handle a Ladder

Make balance and leverage work for you—not against you—in thin air.

By George H. Waltz, Jr.

PS PHOTOS BY W. W. MORRIS

1 To carry a ladder, slip your right arm through the rungs and grip the lower sidepiece. Hold the other side with your left hand (inset). If the ladder is wide, you can rest the upper sidepiece on your shoulder.

4 To steady a ladder, level the base. If the ground is uneven, block up the higher foot with a large slab of wood. When working on slippery ground or concrete, tie a rope from the bottom rung to a suitable pipe or post.

5 To keep your balance, look straight ahead. Men who work on ladders say it's bad practice to look up or down. For best footing, wear heavy rubber-soled shoes with heels. Thin rubber soles don't give the arch enough protection.

2 To raise a ladder, walk it into place. Rest the base against a projecting curb or foundation, as shown above, and move your hands from rung to rung as you walk forward. To lower a ladder, just reverse the procedure.

3 To balance a ladder, gauge the distance. The space from the foot of the ladder to the wall should be a quarter to a third the ladder length. Make sure that the tops of the uprights rest on an even surface.

6 Don't try to carry heavy tools, materials, or paint pots up the ladder with you. You need both hands for safe climbing. The best way is to prepare your materials first, then pull them up after you are in position.

7 Always try to hold the ladder with at least one hand. If your work requires two hands, hook one leg around a rung. If you must lean to one side, hook the opposite leg. Never climb higher than the third rung from the top.

Rehandling a Hammer Is 10-Minute Job

DON'T be a rhumba-beat Charlie (three smacks on the nail followed by three handle taps on the bench to reseat the hammer head). It's cheaper—and much less painful—to put on a new hammer handle than to call a doctor after you fail to duck a flying head. You'll enjoy putting it on, and have a better tool to work with.

A hickory handle and a steel wedge will cost you about a quarter. Get a hardwood wedge, too, or saw one yourself. The photos show what to do next.

Head may be wobbly and still refuse to pull off. Quickest solution is to saw off the old handle just behind the hammer head, as above.

Lay the head across open vise jaws to drive out fragment of old handle in the eye. Use a flat-ended punch or a short piece of dowel to hammer on.

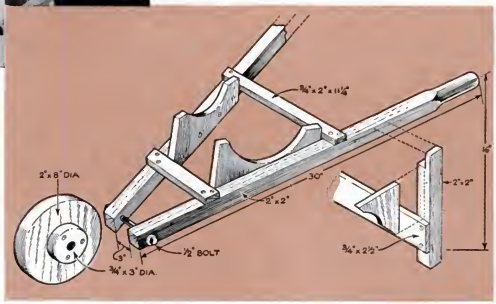
If the new handle isn't slotted, saw a kerf for the wooden wedge. Cut it the long way of the oval cross section of the handle, and about 1¼" deep.

Should new handle be tight, use rasp or knife to trim it where hammer eye turns up shavings. Wedge end won't be tight, as eye tapers out there.

After driving handle in hard, saw off excess ¾" from head. Drive wooden wedge firmly. If it splits, drive the pieces. Trim protruding part flush.

Place steel wedge crosswise on wooden one. Start driving with light blows, with handle on a solid surface. After sinking wedge, file flush. END

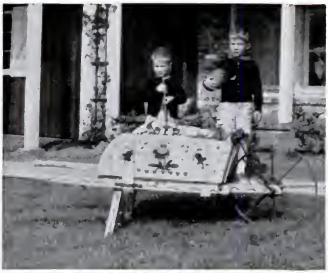
Flower Barrows Dress Up Your Garden



Even though built in a hurry, this little flower barrow (above) serves its purpose well.

Drawing at right shows a fancier project with cradle pieces screwed on to receive keg.

Old-style barrow (below) was cleaned, painted canary yellow, and decorated with decals.



FILLED with flowering plants and spotted in a corner of the lawn, any of these wheelbarrows will add a colorful touch to your garden.

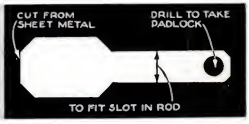
Two of them can be built with odds and ends of lumber and a nail keg. The third one is an old-style barrow that was repaired and painted.

Notice that more than half the nail keg was used. You can cut through the metal bands on the keg with a hacksaw.

For a wheel, glue up and cut an 8" disk from 2" stock. Screw hubs on each side and drill a hole for a ½" bolt that serves as an axle.—*Hi Sibley, Nuevo, Calif.*

A Simple Way to Padlock Your Bolt-Action Rifle

A BOLT-ACTION rifle may be easily padlocked. The bolt is removed and a regular wire cleaning rod—not the unscrewing type—is pushed through the barrel from the breech end. A small key-shaped piece of steel with a hole in one end, as shown in the drawing, is slipped through the slot in the rod at the muzzle end and secured with a small padlock. The bolt then may be replaced if the rod has been cut short and a new loop formed to make it fit the breech more closely. With the rod in place, the rifle cannot possibly be loaded or discharged.—*Evan Wright, Topeka.*



Gus Tames a Runaway

With fishing on his mind, the Model Garage owner takes a day off—and runs into a busman's holiday.

By Martin Bunn

A FEW weeks ago, on his day off, Gus Wilson left Stan Hicks holding the fort at the Model Garage and drove up to Round Lake to see about getting his fishing skiff in shape. One of the local boys always took care of the annual overhaul. After they'd talked the job over, Gus strolled over to the pint-size refreshment stand and bait store that old Tom Strong runs near the boat landing.

"Hi, Tom," Gus greeted the little old man behind the counter. "All set for a busy summer season?" he asked as he fished around in the cooler for a root beer.

"Can't rightly tell, Gus, what with all this war business stirrin' folks up."

Gus finally dredged up a bottle. As he stooped to open it the door slammed behind him. Looking up, he recognized Ken Peyton. Ken runs an amusement park down near the hotel at the other end of the lake.

"Saw your car outside, Gus," Peyton said as he pumped Gus's hand. "I need some advice."

"What's the matter, that one-horse Coney Island of yours falling apart?" Gus kidded.

"Not quite," Ken grinned, "but I've got the usual headaches that come along every year when I open up."

Gus drained the last of his drink and dropped the bottle into the case for the empties.

"It's that Ferris wheel I put in last year," Ken explained. "Remember, I bought an old auto engine from a junk yard and hooked it up with a hand clutch?"

Gus nodded.

"Ran fine all last summer," Ken continued. "Well, this morning I decided to see how she'd got through the winter. I put in the battery, filled the radiator and the gas tank—she had oil—turned on the switch, and poked the starter button. Naturally, she didn't start right off, but after a little she caught and ran smoothly enough. I turned the ignition off, and you know what happened?"

Gus shook his head.

"That fool engine kept right on running. The only way I

Gus removed the spark plugs from the Ferris-wheel engine. "Not likely that it's pre-ignition," he said, shaking his head. "They're all clean."

Ray Quigley

could stop her was to cut off the gas. Luckily, I've got a petcock in the fuel line."

"It's probably nothing more than a bum ignition switch," Gus said. "Want me to have a look?"

"Wish you would, Gus. I've got my car outside, and we can be over there in a jiffy."

"I'll follow you in my car," Gus put in as he followed Peyton through the door onto the landing. "Then I can leave for town right from your place."

"So long, Tom," Gus called back to old man Strong. "See you next week."

Less than 10 minutes later, Gus followed Ken's car through the newly painted wooden arch into Round Lake Park and parked in an open space behind the Ferris wheel.

"There's my runaway engine," Ken said, nodding toward the wheel. "I'll start her up and you can see what I mean."

Engine Won't Stop

The engine, still warm from its earlier run, ticked off without a sputter. After about a minute of running, Ken reached over to the small control panel he'd rigged at the rear of the engine and turned the ignition key to the "off" position.

The engine kept right on running without so much as sputtering.

"See what I mean?" yelled Ken.

"Got a pair of pliers handy?" asked Gus.

Ken reached into a small tool box on the floor of the shed, rummaged around in it, and finally handed Gus the pliers.

"I'll disconnect one of the wires at the rear of this switch," Gus explained as he went to work.

In a moment Gus loosened the small nut and pulled the wire loose. But it made no difference to the engine—it ran right along.

"Humph," grunted Gus. "Can't be the switch after all. Okay, shut off the gas. I want to try something else."

Ken complied, and, as the engine died, Gus reconnected the lead. "Now turn the gas back on and let's see if she'll start with the ignition off."

With the ignition key in its "off" position, Ken pushed the starter button again. The starter ground away without effect.

Now It Won't Start

"Are you sure that gas is turned on?" queried Gus.

"Wide open," Ken called over the whir of the starter motor. "And the hand throttle's cracked open too."

After a few more seconds with no results, Gus reached over and turned the ignition key to its "on" position. Almost instantly, the engine took hold. Then, when Gus turned the ignition key off, it continued to purr along.

"Now, how do you like that, Gus? She'll run with the ignition off, but won't start unless it's turned on."

Gus said nothing and began tracing and examining the wires leading to the switch.

"Been having any battery troubles?" he asked finally.

"Nope," replied Ken. "Took the battery out last fall and kept it up to charge over the winter. Just put her back in place this morning. Why?"

Even Runs Without Battery

"Just wondered," said Gus. Then, using a wrench, he began loosening the nut on the battery terminal lug that led to ground. The clamp came off the post easily. And the engine never missed a beat as the cable popped loose.

"Say, what is this?" Ken hollered. "Ignition off, battery disconnected, and she still runs."

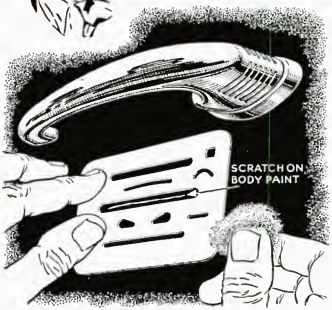
"Could be a bad case of pre-ignition," said Gus. "Let's shut her down and have a

[*Continued on page 226*]

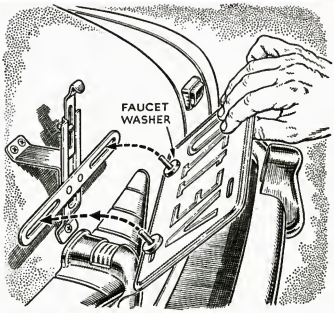
Make Trouble Pay

Had any interesting car breakdowns lately? Gus wants to hear about your tough and tantalizing automotive problems. Write him about the false diagnoses as well as the cures. *Popular Science* will pay $25 to the first sender of each usable story idea. Letters can't be acknowledged or returned. Address Martin Bunn, Popular Science, 353 Fourth Avenue, New York 10, N. Y.

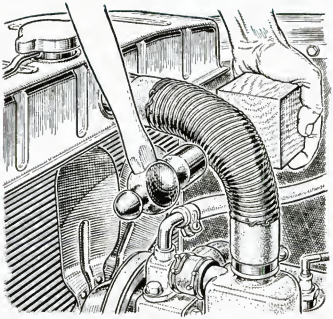
Hints from the Model Garage



Touching Up a Scratch. A draftman's metal erasing shield is helpful for this job. Use it to limit your steel-wool rubbing to the edges of the scratch before applying touch-up paint. Use it again if you work over the area with rubbing compound.



Washers Stop Rattles. A tendency of your license plates to rattle can often be overcome by mounting them with rubber faucet washers placed between the plate and bracket. Enlarge the center holes if necessary for the bolts.

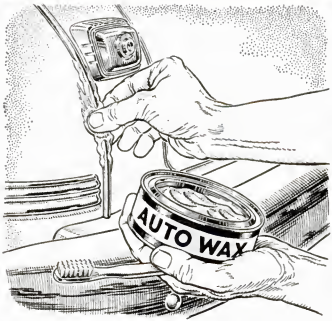


How to Curve Hose. A straight piece of rubber-and-fabric hose can be curved by wrapping it with No. 14 or 16 wire. Space the turns about ⅛″ apart and anchor the ends securely. When the hose is first curved, it may still tend to collapse, but you can make it take its proper shape by pounding with a hammer and wood block.

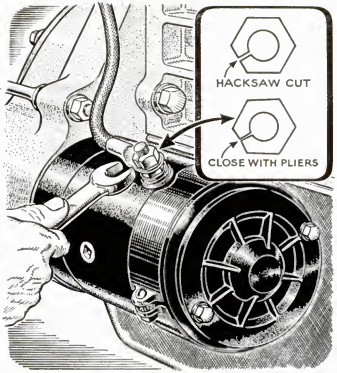
Hinge Serves as Door Stop. An old strap hinge can be used like this to keep a garage door from blowing shut. Mount it vertically with part of one leaf projecting below the bottom edge of the door. Attach a light chain to the free leaf and the door and you'll be able to lift the hinge when closing the door.

Turn the page, please, for four more auto hints.

MORE Hints from the Model Garage



Wax in Joints Curbs Rust. While waxing your car, press a liberal amount in and around the fender welts and other joints. An old toothbrush will help force it in. Do not wipe away the wax. The excess will not be noticeable, and it serves as a good moisture seal, reducing the chances of rust forming in the joints.



Slotted Nut Locks on Stud. If the threads of a stud are stripped or damaged, you can repair it temporarily by slotting a nut and squeezing it in place on the stud with a pair of heavy pliers. The same trick can be used for removing a stud with no unthreaded portion exposed. The threads won't be damaged by clamping the nut.

Tag Holder for Battery Shop. Short pieces of garden hose slotted at one end make good holders for customer identification cards in a battery-charging room. Hose of the ordinary size slips snugly over most battery posts.

It Pays to Clean Wiper Blades. The initial smear that wipers often make when first turned on can be avoided by occasionally rubbing a soft cloth along the blades. This will remove the accumulation of grease, dirt, and oxidized rubber.

Hidden Wear Boosts Your Car Expenses

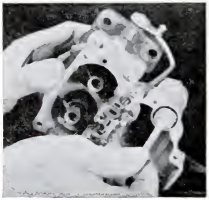
YOU can save money on your car this summer by giving it a pin-point tune-up this spring. Hidden wear always robs an engine of power, pep, and fuel economy, but finding and eliminating it is sometimes a tricky, time-consuming job.

Such wear frequently occurs in the carburetion and ignition systems. The usual type of tune-up, or even a ring and valve job, may fail to bring back all the sparkling performance characteristics that your car

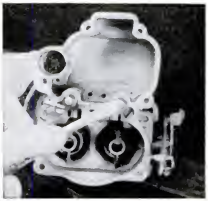
Repairing a series of worn parts in the carburetor and distributor often rejuvenates an engine.

By E. F. Lindsley *Automotive Engineer*

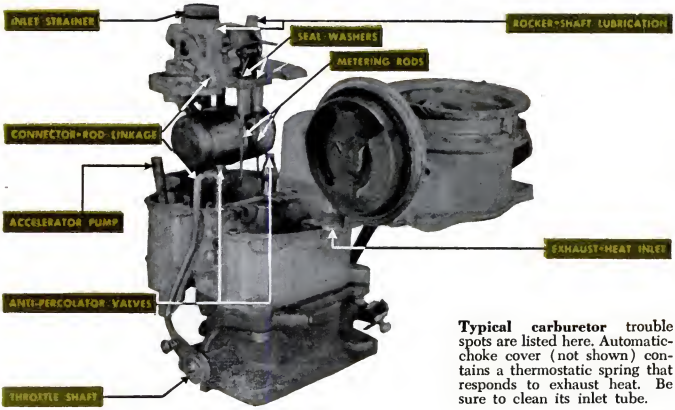
Accelerator pump must give a quick shot of fuel for good snap and pickup. Pump plunger shown was badly worn. A new leather and spring cost little. Inspect the bottom of well for dirt. Even small particles will jam the valve. Most pumps can be connected to the rocker shaft for long, medium, or short strokes to suit the driver and axle ratio. If in doubt, try each position.



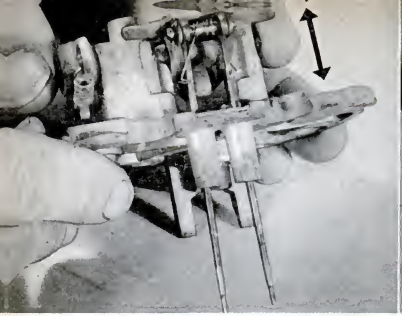
Anti-percolator valves vent fuel vapor from the float chamber when engine is stopped. The one shown below was stuck solid with fuel gum, causing vapor lock. Some carbs have only one such valve.

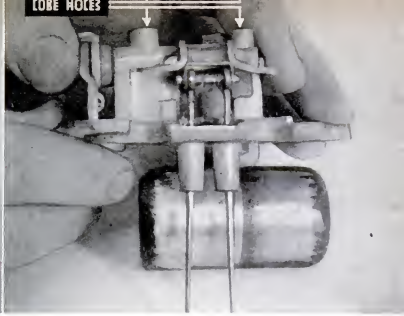


Carburetor metering starts with the float level. Pencil indicates wear on float contact. Check the float for leaks by shaking. Leaks here waste fuel, cause flooding, dripping, hard starts, and rough idling.



Typical carburetor trouble spots are listed here. Automatic-choke cover (not shown) contains a thermostatic spring that responds to exhaust heat. Be sure to clean its inlet tube.





Countershaft on top is pivot point for most critical fuel-measuring system in carburetor. Excessive wear can be detected by gripping ends of shaft and rocking it in its bearings (above). If worn, this shaft cannot do an accurate job of controlling the metering rods. Shaft should be lubricated every time you have the car greased. Washing the dirt from countershaft cover will usually reveal lubricating instructions. Some require oil, some grease, and others graphite. If wear is bad, a new assembly is usually your safest bet.

Wear on control-rod end and in linkage hole may be slight, but it's serious. New parts, rebushing, or bending rod slightly are possible repairs. Also check foot-feed control.

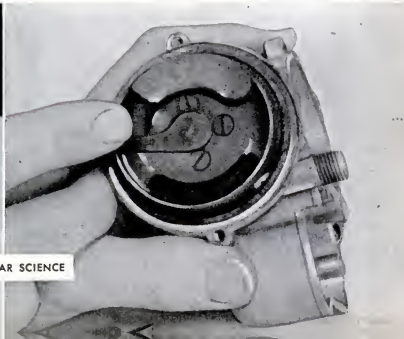
had when it was new, because of insufficient attention to the fuel or electrical systems.

In the carburetor, wear of only .001″ on the jet bore and a similar amount on the metering rod can increase gas consumption as much as 10 percent. A new rod and a new jet are the cure. But this won't do the job completely if you or your mechanic overlook a badly worn countershaft bearing or a dirty automatic choke.

For it is *accumulations* of wear that rob an engine of efficiency. One worn spot may not cause trouble. But half a dozen, piled one on another along a carburetor's metering system or a distributor's timing mechanism, can keep the best of engines below par.

Tracking down and repairing or replacing such worn parts is difficult but worth while. An old car, with its lower friction losses,

In automatic choke, dirt and carbon are main source of trouble. Half-moon-shaped screen at left was almost solid with carbon, and action of lever at right was impeded. Clean choke thoroughly with solvent. A bad cover gasket will let in cold air, keeping choke closed too long.



may even outrun the newest model on the road when you have finished the job.

Before you begin, however, make sure the rings, valves, plugs, cooling system, points, and fuel pump are in good condition and functioning efficiently. If they are not, your troubleshooting will count for nothing.

Your carburetor and distributor may not look the same as those pictured on these pages, but the principles are the same, and these photos show some of the pin points where age and neglect take their toll.

Cleaning Reveals Wear

Because the details you are looking for are easily lost in gum and grime, clean all the parts thoroughly. Use a brush and gum-cutting solvent.

If you have a magnifying glass, use it. Inspect all moving parts and linkages. Search out the surfaces that pivot, slide, rub, roll, bump, or contact each other in any way. Try with your fingers for sloppily fitting shafts and bearings. Poke and pry.

Wherever you spot bright and shining wear, fix it. Close up the hole, plate the shaft, or use a shim. Repair kits for rebuilding carburetors, distributors, and pumps are usually available at nominal cost.

Never remove a part until you have noted its original position. Automatic-choke covers, check valves, needle valves, insulating washers, distributor-drive keyways, and so on all have definite and specific adjustments and locations. Count the turns as you remove needle valves. Note distributor-rotor position when you remove the distributor from the engine. Make small scratch marks, file notches, draw sketches, and write down pertinent facts to jog your memory.

Don't Redesign the Engine

In most distributors, two separate systems control the cam position when the points open or close—and therefore govern the spark timing. One system depends on manifold vacuum, the other on centrifugal force. Neither can operate if the breaker plate is stuck. Under variations in speed and load this plate is constantly moving, seeking to follow a "spark loop" curve ideal for the engine. Interference with its movement, or changes of other parts in relation to the plate, will keep the engine below par.

Throughout the job, avoid major alterations. Remember, you are trying to restore the engine to its original condition, not design a new one. END

Wash out distributor with lacquer thinner and soak small parts in jar. Sticky deposits stop free movement of breaker plate and other parts.

Hardened grease may lock breaker-plate ball bearing. Wash clean with thinner and then lubricate lightly with petroleum jelly.

Ball bearing may wear dent in the distributor housing like this, giving uneven resistance that prevents proper spark timing. Groove liners are available for a quick repair.

Vacuum spark-control unit always suffers from crankcase vapors and rust. A manual check for a springy action and free movement does not necessarily mean the device is perfect, but it shows up worst offenders. Replace if bad.

Summer Driving Tips

You'll enjoy your car longer by taking the simple precautions these pictures suggest.

Examine the cooling water periodically by drawing a sample up into a hydrometer. If you find suspended rust particles, drain the radiator and put in a fresh dose of rust inhibitor. Summer driving conditions may tend to stimulate rusting.

A set of easily made screens for your car will make camping and picnicking more comfortable. Cut and bend ordinary house screening as shown. A carton in the luggage compartment is a convenient spot to carry the screens.

Carry a flare for emergencies. A coil spring attached to a board is a handy way to mount type of flare shown. Spring lets flare swing back and forth, making it more noticeable.

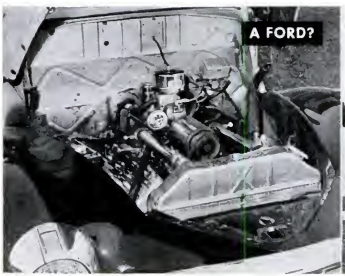
A block of wood with holes bored through it and sponge rubber cemented on one face will clean insects off windshield. Wet it before using.

Check your battery every week and add enough distilled water to keep the electrolyte level above the plates. Evaporation is far more rapid during warm weather than during cold.

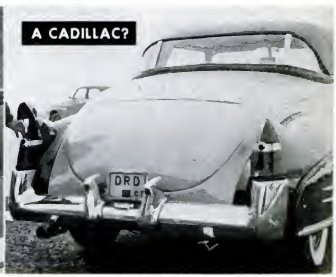
Park in the shade as often as you can—and you'll save money. Gasoline vaporizes rapidly in the direct rays of the sun. Your paint will stand up better, too.

What's This Car?

A NASH?



A FORD?



A CADILLAC?

Everybody is confused when this odd but impressive job flashes by.

A QUICK glance at this car shows a Nash grille, Cadillac fishtail fenders, Cadillac bumpers, and Lincoln Zephyr wheels. Inside there's a chrome-plated Ford V-8 engine, a Mercury steering wheel, and a Lincoln Continental transmission.

Richard R. Dixon, an apprentice sheet-metal worker in East Hartford, Conn., bought the car secondhand for $650, and has spent more than $2,000 and 2,000 work hours rebuilding it. He rebored the cylinders, added high-compression rings and heads, substituted a stronger crankshaft, installed an aluminum flywheel—and wound up with an engine that develops 165 hp.

He switched the springs to lower the body, moved the shift lever from the floor to the steering column, reupholstered the seats in red and white leather, applied reinforced composition leather to the top, painted the body cream and the fenders maroon, and added many accessories. One of these, as you'll see from the engine view at left, above, is a built-in vacuum gauge.

Dixon estimates his car—originally a 1939 Ford convertible—will now do 125 m.p.h. But he never has opened it up.

Bending Catch Keeps Wiper Blade On

ON MY car the wipers hang from the windshield top. On several occasions, the wind lifted a blade and swept it away. I have found that bending aside the key-type blade catch after the blade is installed prevents this.—*James H. Carll, Schenectady.*

Winner of first Indianapolis 500 in 1911, Ray Harroun practices for the event in his Marmon Wasp. To replace riding mechanic who kept driver informed of cars creeping up, Harroun installed a rear-view mirror. This is said to be the first use of such a mirror on a car.

I Cover the Races

By Paul Shideler
Chief Photographer, Indianapolis News

A veteran tells you how the Memorial Day Classic is photographed.

ON MEMORIAL DAY, 1948, Frank Salzarulo heard tires screeching while he was standing in the infield of the Indianapolis Speedway. That meant trouble, so he whipped his camera into shooting position, caught the car with the screeching rubber in his view finder, and snapped. Then he began looking around.

"This what you're looking for?" a bystander called, and waved a camera slide.

In his haste, Frank had tossed it 25 feet. He had followed my instructions almost too well—and gotten the remarkable picture on the bottom of the next page.

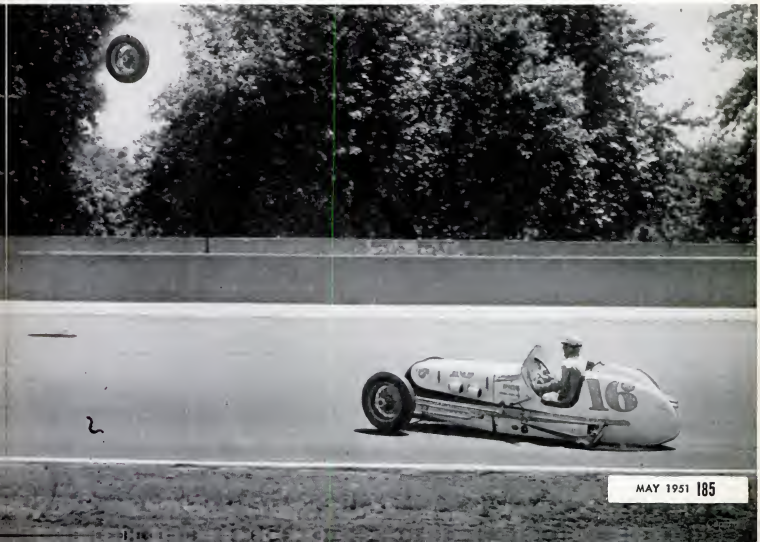
We have to be fast. Having covered the races at the Speedway since 1909, I tell photographers working with me to release the slide catch on their Speed Graphics in advance, pull out the slide just a fraction of an inch, and listen for screeching tires. Frank had been warned not to look first, but get his camera ready, then look through his view finder to see what was happening and in the same instant to pull his slide.

The photo I now prize most resulted from the sportsmanship of a gentleman named Ralph DePalma in 1912. Leading the field by more than 10 miles, with only two laps to go, DePalma's engine quit cold

Want a lift, VP? Paul Shideler, author of this article, invited U. S. Vice President Thomas R. Marshall for a ride in the belt-driven Comet Cycle Car that Paul used to cover the 1914 race at Indianapolis. Bill Herschell, Shideler's coworker, snapped the picture.

A hot finish. Accidents always make news at the races. Here is Duke Nalon's car burning after a crash during the 1949 race. To round out the picture, George Tilford, *Indianapolis News* photographer, waited until he could include a speeding car in the foreground.

Johnny-on-the-spot. Speedway photographers have to be just that for dramatic shots like one below. The flying wheel at the upper left came off Duane Carter's car when an axle broke in the 1948 race. Split-second action by Frank Salzarulo got both the wheel and the sliding car.



on the backstretch. But—smiling every step of the way and waving to the crowd at frequent intervals—he pushed it around the north turn and down to the finish line. There was never a better loser.

In the early days, pictures taken at a shutter speed of 1/1,000th looked like stills. So we learned to shoot at 1/500th, even though it blurred the car slightly, because that gave a visual suggestion of speed. Then, as car speeds rose, we upped our shutter speeds to 1/750th, and finally 1/1,000th, and began to swing our cameras with the car we wanted as it passed. Such "panning" blurs the background and suggests speed, yet sharpens the picture of the car.

At this year's race, our shutter speeds will be 1/1,000th of a second, and we will focus at 100 feet. If it's a bright day, we'll stop down to f/8; if dull, we'll open clear up. And we will pan the races.

Tips to amateurs. We press photographers use Speed Graphics largely because they are our standard equipment and we are used to them. Other cameras can be used. With a spring-wound 35-mm. camera with a 90- to 110-mm. lens, you might get a couple of dozen shots out of one exciting event.

A sunshade is imperative because you never know when you'll have to point your camera into the light. And set your aperture for the shadow side of the subject. You may get halos around the object that you want, but it will be sharp.

Press coverage. Covering the Indianapolis 500 for the press requires planning and teamwork. I station one man near each of the 2½-mile Speedway's four turns, and another at the pits where cars are serviced.

Memorable moment. I have never been nearer death than I was the day the Speedway opened. Louis Chevrolet was about to win a 25-mile race. I dashed out to the middle of the track for a close-up. All the cars then burned castor oil and the smoke was terrific. I couldn't see beyond Chevrolet's car. A split second after I had snapped my picture, Bob Burman's car loomed out of the smoke coming 80 miles an hour, straight for me. He couldn't possibly veer more than a few inches. I froze in my tracks and sucked in my breath—and the car brushed my clothing. END

A smiling loser. Ralph DePalma pushes his car to the pits after engine failure forced him out of 1912 race while far in the lead. This is Paul Shideler's most prized photo.

Everybody happy. Youngsters have a comfortable place to play or sleep while parents drive.

Folding Youth Bed Fits the Back Seat

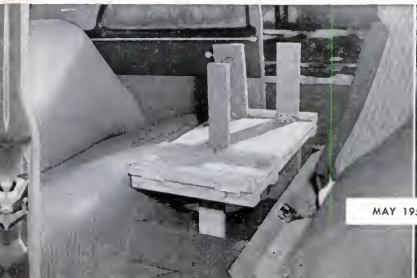
HAVE you ever wanted to take young children on an overnight car trip? Or carry an awkward piece of furniture that would not quite go into the trunk? A folding platform placed ahead of the rear seat of the family sedan will solve both problems. It costs little to make, and anyone with a hammer and saw can put it together in an hour or so.

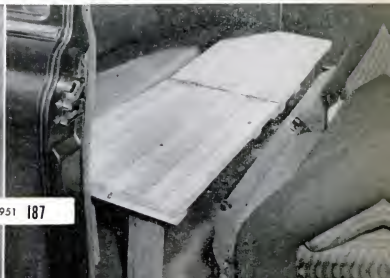
Scrap lumber about ¾" thick can be cleated together, as in the platform shown, or you can use a piece of plywood. Cut legs just long enough to raise the platform level with the cushion. Locate them so they are braced by the cleats when open.

When not in use, the platform folds flat, and stores nicely in the luggage compartment.

Platform consists of two sections hinged together. Each half has three hinged legs, the inner one located to clear the drive-shaft tunnel. Screen-door hooks lock the legs in position.

Halves hinge out like this, bringing the platform level with the rear seat cushion. In most cars, this provides enough space for a crib mattress, and you can put the children to bed.





Ways To Dress Your Doorway

A canopy over the front entrance will accent it pleasingly, and as a bonus give shelter where you need it most.

DOES the door to your home open right into the weather? On such an entrance, a canopy would provide shelter while a person waits at the door, fumbles with a key, or opens an umbrella. And if your house is one of a row of look-alikes, a canopy will set it off from its neighbors.

Here are four typical houses to which canopies have been added. Note how greatly such a small addition changes the appearance of each house.

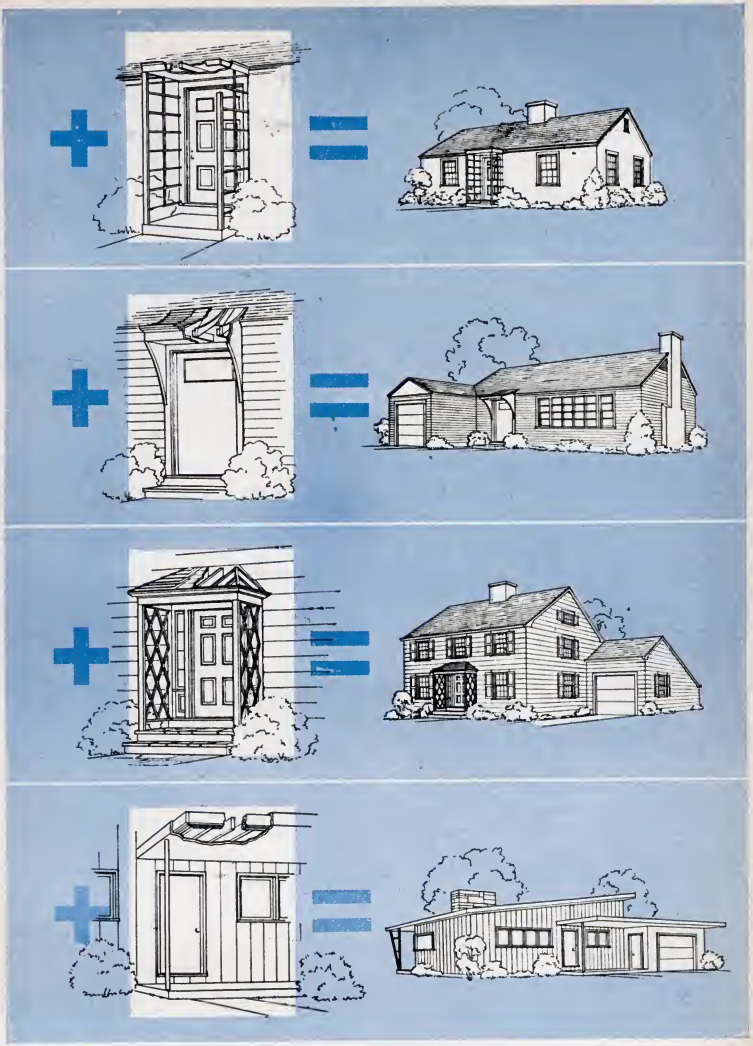
The flat-roof type, suggested for the house at the top of the page, is supported on two-by-fours and has a latticework for vines. The roof framework also may be two-by-fours, covered with sheathing or ½″ exterior-grade plywood, with roll roofing or sheet copper over that.

The curved canopy is hung in brackets of ¾″ outdoor plywood. Its roof rafters can be bandsawed from two-by-sixes. Over its sheathing or ¼″ outdoor plywood, the same kind of shingles or other roofing that is on the rest of the house should be used.

The hip roof for the canopy shown on a two-story house is harder to build. The necessary angle cuts call for careful layout and good carpentry. Don't tackle one like this alone unless you can do finicky work.

The modern cantilever roof at the bottom of the page is supported by a 4″ lally column, anchored down against wind uplift. Rafters can be butted and toenailed, or hung by strap hangers, into a framework of tripled two-by-sixes. Ideally, the other rafter ends should be extended into the house and secured to the plate, but they could be notched into a member spiked on over the sheathing.

Adequate flashing to keep rain out between the house and canopy is vital. A flat roof should have enough forward pitch to shed water, and a gutter to lead it off.—*Carl T. Sigman and William L. Ward, Jr.*



Paint Roller Buffs Silverware

When my wife handed me some silverware to polish, I groaned because I had no buffing wheel. Then I took an unused sheep's-wool paint roller, slipped it on a wooden mandrel that was tight enough so that it wouldn't slip under buffing pressure, and put it between the lathe centers. I charged the wool with rouge, belted the lathe for high speed, and did the job in jig-time.—*J. C. Branstetter, San Francisco.*

License Tag Makes Back-Step Scraper

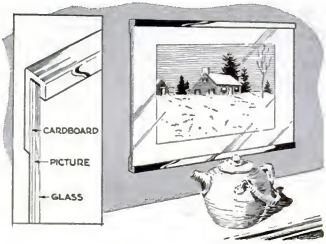
Living in a new house can be tough on a housewife until the lawn sprouts and garden walks are laid. To help keep our kitchen floor clean, I nailed an old license plate to the back doorstep. It makes a fine foot scraper.—*R. Woodbury, Natick, Mass.*

Hang Up Your Gloves to Dry Them

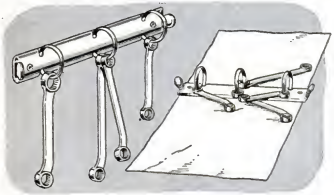
This simple wooden rack holds a pair of rubber gloves for drying. Two ½" dowels are fastened in a plywood base with waterproof glue. Space them about 2¾" apart and round off the tops. They should be smoothed by wetting, allowing to dry, and then sanding to remove raised grain. Repeat until no grain-raising occurs. The base can be painted to resist dripping water.—*Walter E. Burton, Akron, Ohio.*

Easy Way to Display Your Prints

Stainless-steel cap strip, used for edging tile board, makes attractive frames for glass-covered prints (below). Attach two lengths of capping to the wall, spaced so that the glass just slides between the strips. Framed in this way, prints can be changed easily.—*G. H. Kuhn, Amsterdam, N. Y.*



Your Small Wrenches Will Always Be Handy If You Carry Them This Way



The metal spine and rings of a worn-out loose-leaf notebook can be used as a carrier for small box wrenches. One three-ring binder will hold a full selection of sizes, keep small wrenches from getting lost at the bottom of your toolbox, and make it easy to pick out the one you need. If you carry the wrenches in your car, lay them flat in the metal trough of the binder, and tie a rag around them to keep them from rattling.—*C. E. Cassaday, Kansas City, Mo.*

How to Defend Defense Metals

Conservation begins at home. Properly guarded, many of your appliances should last forever.

By Kenneth M. Swezey

THESE headlines tell a story we all should consider carefully—less steel for automobiles and refrigerators, less aluminum, tinware, and stainless steel for pots and pans, less copper or brass for civilian use, and less nickel, silver, and chrome for ornaments and household appliances.

You can help—both yourself and your country—by making your present metal articles last longer. Few metal articles except machine parts and tools that are subjected to hard use wear out in service. Instead, they corrode because they are neglected, or are worn out by bad cleaning methods. Properly cared for, most solid metal gadgets should last a lifetime. Even plated

ware can be kept in good shape for years to come. Making metals last longer is chiefly a matter of preventing corrosion and cleaning them properly.

Making Your Own Cleaners

Good ready-made cleaning and polishing compounds for all common metals can be bought in grocery and department stores and gas stations. If used discreetly, these should be harmless and effective. For those who like to make their own, several inexpensive and easily put together formulas that are harmless and effective are included in this article.

It also helps to know a few chemical and mechanical quirks of different metals. You can find these out by performing the simple experiments illustrated below.

Corrosion of iron and steel is caused by the reaction of these metals with oxygen and moisture. Since the product, rust, is porous, it holds moisture and so accelerates corrosion of the metal beneath. Before rust can be stopped, existing rust must be removed. On large pieces this can be done with a wire brush or steel wool.

Iron and steel building materials, after being cleaned of rust (or when first installed), can be protected by first coating them with a metal primer and then with two or more coats of good oil paint. Tools can be protected by keeping them in a dry place and wiping them occasionally with lubricating oil, or with special oil-base corrosion preventives sold in hardware stores and gas stations.

Electrons Are Mischievous

Often corrosion is speeded up tremendously by electrolytic action. Whenever two different metals are in contact in a conduct-

Simple Tests Show How and Why Metals Corrode

SILVER. Put a little iron sulphide into a glass jigger. Put this and a silver spoon inside a wide-mouth jar. Add a drop of dilute sulphuric acid to the sulphide. This will produce hydrogen sulphide gas. Cap jar tightly. Leave the spoon there overnight, and it will blacken, as at left. Sulphur compounds in foods and the air tarnish silver.

COPPER AND BRASS. Green film that forms is usually a carbonate caused by reaction of copper with carbon dioxide and moisture. To see this, put a polished strip of copper in each of two screw-cap jars. Pour a little water into both. To one, add a half teaspoon of baking soda and a little vinegar. Cap both jars tightly as soon as the carbon dioxide bubbling stops. Next day, the strip exposed to moist carbon dioxide will be green. The other will be bright.

ing solution, the metals act as the plates in a battery cell, and the more active metal tends to dissolve. Tinware furnishes a good example.

Since tin is a relatively soft metal, tinware should never be cleaned with harsh scouring powders or steel wool. Food can be dislodged from a pan by soaking in hot water that contains a detergent, then gently scraping the utensil with a wooden spoon.

Some Films Are Protective

Galvanized iron—iron coated with zinc—also sets up electrolytic action when the coating is broken. But in this case the zinc, being the more active of the two metals, tends to react and spread a protective coating of zinc oxide over the iron. This protective action, however, cannot go on indefinitely. So if the zinc coating becomes worn away too much or broken, paint the article.

The green film or patina that forms on unprotected copper and brass is usually a carbonate of copper caused by a reaction with carbon dioxide and moisture. If it forms on the inside of cooking utensils, it must be thoroughly removed because it is poisonous. Unlike iron rust, however, copper carbonate protects the metal beneath from further action. Whether it is desirable on copper gutters, roofs, and decorative objects, therefore, is just a matter of taste.

Silver tarnish is caused by sulphur compounds in foods and in the air. Hydrogen sulphide from the smoke of factories causes silver to tarnish more rapidly in cities than in the country. Tarnish can be retarded by wrapping stored pieces tightly in cellophane or tissue paper.

Tests made by the Bureau of Standards indicate that tarnish can be removed from silver with less loss of metal by using the

TIN AND GALVANIZED WARE. Tinware is usually sheet iron coated with tin; galvanized ware is iron coated with zinc. When intact, both coatings resist corrosion and protect the iron underneath. If coating is broken, electrolytic action occurs. But the results differ with the two types of ware. You can see this by scratching a tin can and a piece of galvanized ware (top photo) and leaving them in a damp place several days. Less active chemically than iron, tin causes iron to corrode faster than if it were *not* coated—and the scratch will spread. Zinc, being more active, produces a corrosion product that protects the iron—and keeps scratch from spreading.

STAINLESS STEEL. A thin coating of oxide produced by heating darkens the outside of polished stainless steel. You can duplicate this by holding a polished steel strip in a candle flame. Such a coating is so thin, however, that you can remove it easily from highly polished ware with metal polish or a mild scouring powder and from less highly finished pots with steel wool.

ALUMINUM. Such pots darken when alkaline substances are cooked because impure aluminum oxide is formed. They also blacken if you cook foods that contain iron, the iron being deposited. Boil water containing soda or spinach in an aluminum pan, left. You can then brighten the pan without effort by boiling water containing vinegar, right. In actual cooking, acid foods such as tomatoes or sauerkraut will do the same trick. The dissolved aluminum oxide is apparently harmless and tasteless. Iron is beneficial.

simple electrolytic method shown on this page than by laborious hand polishing. If the silver does not come up as bright as you would like it, rub it with silver polish.

Aluminum and Magnesium

Aluminum is exceedingly active chemically, and its surface oxidizes immediately in air. Fortunately, this surface film is so hard and compact that it stops further oxidation. Ordinary oxidized aluminum still reacts, however, to acids and alkalies—even weak ones used in cooking and cleaning. Alkaline scouring powders and cleaners should never be used. They darken and pit aluminum.

Magnesium is such an active metal that it rapidly acquires a dull coating, either white or gray, in moist air. Corrosion then stops. Vinegar and water will remove it.

Nickel plate and polished chromium can generally be cleaned satisfactorily with nothing more than a soft cloth moistened with warm water and a little mild soap or synthetic detergent. If this is not sufficient, use a mild scouring powder. You can make this as shown on the next page.

To store silver: Make a bag from cotton flannel. Soak the material in a solution made by adding an ounce of zinc acetate to each pint of water. Squeeze out excess solution and dry the bag. Silver stored in bag won't tarnish. Wash the stored silver before using it.

To clean silver: Electrolysis makes it easy to make flatware sparkle. *(But don't use it on hollow ware, knives with cemented handles, or silver with a French or oxidized finish.)* Just put the pieces in the bottom of an old aluminum pan or in a glass baking dish, the bottom of which is covered with a strip of aluminum foil. Pour in a near-boiling solution made by dissolving a tablespoon each of washing soda and table salt to each quart of water. When tarnish disappears, rinse the pieces in clear water and dry them thoroughly.

To remove rust from tools: In a quart of water, dissolve a tablespoon of oxalic acid or a similar amount of acid-type automobile cooling-system cleaner. Heat the solution and immerse your iron and steel tools. Use tongs or rubber gloves—the solution is caustic and poisonous. Rinse in clear water and dry the tools well after the rust has disappeared.

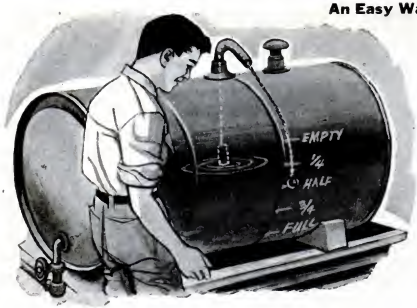
To make scouring powder. Measure out nine parts of whiting (from a paint store) and one part of trisodium phosphate (Oakite or Dif). Mix by shaking together in a box or bag for several minutes. This is an inexpensive, non-scratching, and effective compound for cleaning porcelain, brass, copper, nickel, chromium, and stainless steel. Wet with water.

To clean magnesium: Griddles and similar articles can be swabbed with a solution made by diluting a little vinegar with an equal amount of water. Magnesium and its oxides readily dissolve in weak acids. But such cleaning is merely for looks. The coating protects the metal.

To clean brass or copper: An old reliable formula for removing tarnish is salt wet with vinegar. After the pieces have been cleaned up, brush on clear lacquer to keep them shiny.

To make silver polish: Buy precipitated chalk at a drugstore. Make a paste by moistening with household ammonia that you have diluted four parts water to one of ammonia. After rubbing off tarnish, rinse the silver.

An Easy Way to Put a Gauge on an Oil Drum



THIS indicator will help you keep track of the kerosene or oil left in a back-yard drum. Make a weighted float from a can or jar small enough to pass through the bung hole and attach it to light chain or several key chains fastened end-to-end. Slip the chain through the vent pipe and tie a counterweight to the other end. Mark the indicator position when the barrel is full and when it's empty, and estimate the in-between positions. Be sure the chain runs freely without sticking or binding.—*J. G. Schad, Evans City, Pa.*

Card Holder Clips to Drill Post

YOU can "file" tap-drill sizes and similar information right on your drill press. Slip the data into a plastic-window card holder and clip the holder to your drill-press post. Card holders of the type shown, made for attaching drivers' licenses to car steering posts, are available at auto and five-and-dime stores.—*H. Leeper, Canton, Ohio.*

Stapler Holds Sole While Glue Sets

IT IS sometimes difficult to clamp composition oversoles properly when you attach them to shoes. A stapling gun solves the problem. Apply adhesive according to instructions, press the soles in place, and drive a row of staples part-way in. When the cement has dried, pull the staples with pliers.—*Walter Haase, Wethersfield, Conn.*

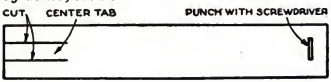
Shop Light Moves Where Needed

THIS counterbalanced shop light gives the light you need just where you need it. It's fully adjustable up and down and side to side.

It consists of a pulley that rides along a taut supporting wire over the bench, and a weighted cord tied to the lamp socket. If the counterweight is right, the lamp stays put. Make sure there's no weight on the electric wire and leave enough slack for travel.

Insulation Straps Cut from Tin Cans

WHILE I was insulating my water pipes I ran out of pipe-insulation straps. So I snipped out the strips from empty fruit-juice cans. I punched an opening at one end and cut a tab at the other. These straps work as well as the regular ones, though the sharp edges have to be handled with care.—*A. J. Fauldner, Syracuse, N. Y.*



Author's living room has a slab floor, on which a soft, gray-green rubber-base paint has withstood scuffling of four children and a dog for two years.

How to Color Concrete

New dyes, stains, and paints make it easier . . . but your floor should first be cleaned and acid-etched.

By Steve Mashek

IT'S now easier than it used to be to color your concrete floors, indoors or out. To meet the growing use of slab floors, manufacturers have perfected new colorings that are both attractive and durable.

Coloring concrete floors is still a lot more work than painting wood. But when you see what the new dyes, stains, and rubber-base paints can do for your porch, terrace, sidewalk, basement, or garden path—well, you'll find it worth the trouble.

Dyes and stains give roughly similar results, but differ in make-up and application. They are popular for outdoor use where evenness of color is less important. Unlike even the best paint, they won't rub off under hard wear. But if the density and surface condition of the concrete is not uniform, or it is badly stained or spotted, the color is apt to let such imperfections show through.

Rubber-base paints, made especially for concrete, will uniformly color any concrete surface. Such paints are excellent for the slab floors of many modern homes and for basement recreation rooms. They also may be used on outdoor surfaces.

I put one of the chlorinated rubber-base paints to a pretty severe test in my own home after a disastrous experience with an ordinary oil paint. That paint peeled, cracked, and wore off badly where the traffic was heavy. With drum and disk floor sanders, plus a good deal of elbow grease, I removed the worst of it and replaced it with two coats of rubber-base paint. After two years, this floor is still in excellent condition —and my household includes four active children and a dog.

Hardeners. There are excellent products for hardening and dustproofing concrete. They are easier and cheaper than stains or paints, but they don't do much to beautify the surface. However, you might be inter-

Spot cleaning to remove oil, grease, or soap stains can be done with a lye solution. Pour the solution on shavings or sawdust and let it stand overnight. Then scrape the spot with a putty knife or old chisel. Repeat the treatment if the stain is stubborn.

ested in one of them for a shop or basement.

To treat a clean, dry floor, you just spill some of the hardener from a bucket and spread it with a mop or brush.

But if you want color, you must use stain, dye, or paint. Stains come in a lot of colors and can be used alternately. This enables you to make concrete look like varicolored stones. Typical dye colors are tile red, maroon, brown, and a soft green.

In rubber-base paints, many different colors are available, and by mixing these you can get just about any shade you want. My gray-green mixture is very attractive. A neighbor of mine used two gallons of concrete (light) gray to a quart of dark brown to get a neutral tan shade for his living room.

You can also tint rubber-base paints with oil colors, but there is some risk involved. If the concrete should later become damp, one manufacturer warns, the color might be affected.

That's why rubber-base paints were born. Oil-base paints peel off concrete when the concrete gets damp. Alkali is leached out of damp concrete, and softens the paint. Rubber-base paints are not affected this way.

Before a slab is colored in any of these ways, it should be cleaned and acid-etched.

Cleaning. The kind of cleaning required depends on the condition of the concrete. If your floor only needs a general cleaning, scrub it with a solution of trisodium phosphate dissolved 1 lb. to a gallon of warm water.

If your floor has oil paint on it, you'll have to remove all the paint before staining or dying. One way to remove paint is with lye. But wear rubber gloves when you work with it. Goggles are a wise precaution, too.

Mix a solution of 1 lb. of lye to a gallon of water. Dissolve the lye slowly and be careful that it doesn't splash on you. Pour the solution on the painted concrete and let it stand an hour. Then scrub it with a stiff brush and flush the surface with plenty of clean water.

If you would rather not use lye, you can remove the paint with a floor sander. Use open-coat silicon carbide paper No. 3½-20, or No. 4-16 where there are several coats of old paint. You'll also need an edger to get close to the walls.

Even when using rubber-base paint, the makers would like you to remove all old paint. If you neglect to take off small patches that are not sticking properly, they will raise and peel when you apply the first

Dyeing. Pour dye in flat-bottomed container. Use stiff brush. Careful watching for light or glossy spots and hard scrubbing are needed.

General cleaning can be done with trisodium phosphate—1 lb. to a gallon of warm water. Scrub with a stiff brush (above) and then wash with clean water. Etching with acid (above) removes slick surface from well-troweled concrete. Wear rubber gloves and boots.

coat of rubber-base paint. If that happens, however, you can scrape such places, spot-coat them, and cover them with the second coat of paint.

Besides old paint, you may have to remove spots of oil or grease. And in a laundry room there may be spots of soap. To remove oil, grease, and soap, spread sawdust over the spot, soak it with lye solution overnight, scrape it off, and wash it with hot water.

Acid etching is the second step. This removes the slick surface and opens pores so stain or dye can penetrate the concrete and get a good grip. It is more important before staining or dyeing than it is before painting. I know from experience that you can get by without etching most concrete, but the results are less satisfactory.

One gallon of muriatic acid mixed with 2 gallons of water will etch 150 to 200 sq. ft. Mix it in an enamelware crock or a wooden bucket if possible. A galvanized bucket will do, however, if you first coat the inside with vaseline or axle grease.

Slosh the solution on the concrete and scrub it with a long-handled brush. It will fizz when it hits the floor. It should. That means it is working. Don't try to spread it too much. Work it in. You may need two or more applications. Keep it up until there are no more spots that feel slick to your touch. For small, stubborn areas, use a 50 percent solution.

When you're finished de-slicking, flush the floor with plenty of clean water and let it dry thoroughly. Outdoor slabs usually dry quickly, but a basement may take a couple of weeks.

Dyeing. Figure on 1 gallon of dye to

Staining. Apply with a paintbrush. First coat will foam. Brush it out just enough to get rid of the foam. Work to a wet edge.

Painting. Second coat of rubber-base paint is being applied to this floor. Such paint goes on very much like ordinary oil-base paints.

each 175 sq. ft. Pour it into a flat pan and keep it stirred. Apply it with a long-handled brush. Keep putting it on for about 20 minutes—until the first part of the floor has taken on an even, dull tone. Then go over this area again, scrubbing in more dye. This is called fixing. If any glossy spots show, scrub dye off them and into light areas.

When you have dyed the whole floor and it has dried overnight, examine it in good light. If there are any glossy spots, just rub them hard to remove the excess dye. Then give the floor a day or two to dry (give a damp basement a week).

Dressing completes the job. It comes with the dye, and can be either the standard type or what is called the no-buff kind. If you use the standard dressing, scrub it on with that long-handled brush, give it an hour to dry, and then polish it with the same brush. If the brush sticks to the surface, let the floor dry a little longer. Clean your brush in turp and let it dry before you polish with it.

The only maintenance such a floor will require is occasional dry mopping or sweeping with a floor broom. When the dressing begins to wear off after months of hard use, simply put some more on the worn spots and buff as before.

Self-polishing dressing is brushed on, a full, wet coat, and let dry overnight. A gallon covers about 400 square feet.

Staining is a three-coat job, if you use one of the special concrete stains recently put on the market. You begin by brushing on the stain, putting it on quickly. It will foam, and you should brush out the foam and then leave it alone. To avoid lap marks, work to a wet edge, just as in painting.

Give the first coat about eight hours to dry and put on a second coat in just the same way. The finish coat, however, is a different material that is sold along with the stain. Before applying it, you should mop the stained surface with water and hose it off to remove any residue. The finish coat is spread on with a soft cloth. It completes the coloring process, and also gives protection.

Rubber-base paint goes on very much like oil paint, and requires a thoroughly dry surface. You'll need a gallon of paint to put the usual two coats on 150 to 200 square feet of floor.

In addition to the paint, you will need some of the special thinner that is supplied for it. Ordinary paint thinner or turpentine will not work. You may want to thin the first coat slightly for easy brushing. And you'll need thinner for brush cleaning.

Allow 24 hours drying time between coats and after the second coat is put on before doing much walking on the floor.

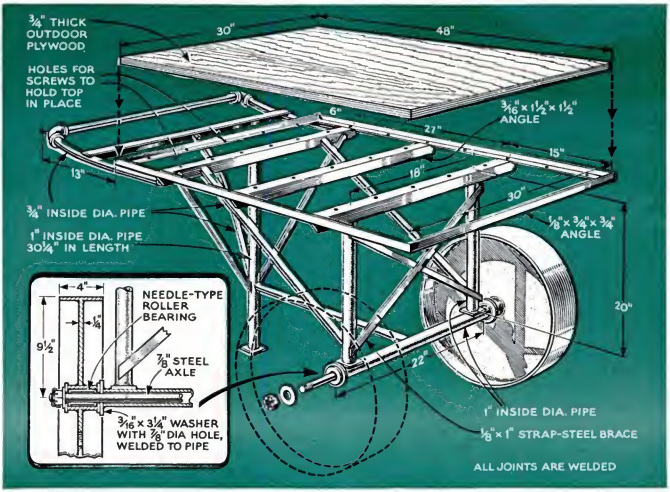
The solvent used in this paint has an odd and rather penetrating smell, but not an unpleasant one. Don't leave any food—especially anything absorbent like butter—exposed in the room or it will pick up a strong flavor from the paint while it is drying. END

Like to loaf in the sun on summer weekends? See PS next month for an easy-to-build lounge chair for beach or lawn.

COLORING CONCRETE

FINISH	CLEANING	ETCHING	1ST COAT	2ND COAT	3RD COAT
Dye	Cut grease and soap stains with 1 lb. lye to gallon of water. Pour over layer of sawdust, leave overnight, then scrape. Remove old paint with floor sander, or lye solution. Let solution stand 1 hour and scrub with brush.	If slab has smooth-troweled surface, scrub with 1 part muriatic acid to 2 parts water. Flush with clear water and let dry.	Scrub in with long-handled brush. Give 20 minutes to take on dull tone.	Same as first coat. Let dry 48 hours.	Scrub on dressing. After about 1 hour, polish with same brush.
Stain			Apply with paintbrush, brushing out foam.	After 8 hours, put on 2nd coat in same way. Let it dry 8 hours.	Mop and hose off with water. Spread finish with soft cloth.
Rubber-base paint	Same as above, except that old paint need not be entirely removed unless it is peeling.	Etch as above if slab has a very slick surface.	Apply with paintbrush. Let dry 24 hours.	Same as first coat.	Ordinarily no 3rd coat is needed.

FOR YOUR POPULAR SCIENCE INFORMATION FILE



Builder's Work Table Rolls to the Job

THANKS to the roller bearings and wide-tread wheels, this sturdy work table can be easily moved to the most convenient spot during building jobs. It was made to withstand punishment on outside jobs.

Wheels consist of steel tires 4" wide welded to disks of ¼" steel, with housings for the bearings. The axle passes through washer flanges welded to each end of a 22" length of 1" pipe.

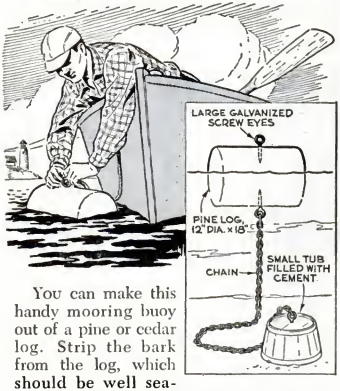
Before screwing the plywood to the frame, give all the metal a coat of red lead and paint.—*Hi Sibley, Nuevo, Calif.*

The Correct Way to Solder Phonograph Plugs to Shielded Wire

THOUGH often troublesome to the novice, soldering phono plugs to shielded wire isn't a difficult job. These plugs, although designed for linking phonographs, recorders, microphones, and amplifiers, are also handy in other low-voltage rigs where you need a quick-disconnect joint.

Cut off 2" of braid and bare 1" of the inner conductor. Flare out end of the braid with a pointed tool. Slip the plug over the wire until the bare tip comes through the prong. Flow solder down the wire into the prong. When the conductor is firmly bonded, clip off excess wire. Then solder the flared braid to the neck of the plug.

A Place to Tie Up Your Small Boat



You can make this handy mooring buoy out of a pine or cedar log. Strip the bark from the log, which should be well seasoned, and give it two coats of red lead. Besides protecting the wood, the red color will stand out against the water.—*Wallace Genthner, Troy, N. Y.*

Nailing Pad Up Keeps It Handy

A SHIPPING-ROOM stamp pad, tacked to the wall above the bench as shown, won't get covered over with packages and papers, and can't be borrowed. A screw eye holds the pad closed when it isn't in use.

Burner Made from Cigarette Lighter

NEED an alcohol burner for your shop? You can make one out of a dime-store cigarette lighter and a small India-ink or similar bottle. Discard the bottom half of the lighter and pull out the cotton packing from the main part. Pour alcohol into the bottle and wedge the lighter in the neck. If the opening is too large, wrap tape around the lighter. When the burner is not being used, keep it covered with the original cap. —*William B. Eagan, Louisville, Ky.*

Quickly Made Game for Rainy Day

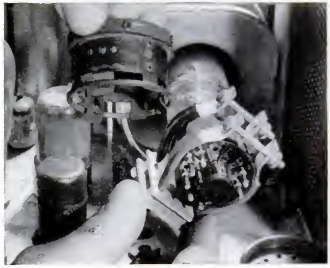
HERE'S a simple game to amuse children who must stay indoors. Cut numbers from a calendar and paste them in each compartment of a plastic egg tray. To play the game, place the tray on the floor, stand about three feet away, and toss buttons, one at a time, into the marked compartments.—*Myrtle Odland, Clarion, Iowa.*

TV Wire Replaces Handle Strap

WHEN the handle strap on my camera case wore out, I replaced it with a strip of ribbon-type television twin-lead wire. I doubled both ends of the wire and riveted them to the case.—*H. Holsten, The Bronx, N. Y.*

New Trap May Brighten TV Picture

REPLACING an old ion-trap magnet with a new or more efficient one often will brighten a TV picture. Traps are available in single- and double-magnet types. Make sure the new one matches the original. Rotate and slide the magnet on the tube neck until you get the brightest image. Then readjust the focus coil slightly if necessary to make the picture fit the frame.



Jet Interceptors Dart 1,000 Feet

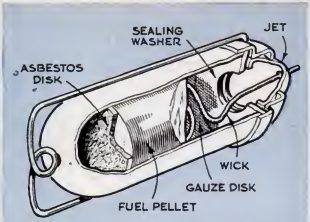
A jet engine powers the model. Loaded with a fuel pellet, the engine weighs ¾ oz. For each flight, you ignite a wick that sticks out. One pellet gives a 15-second burst of power.

Model builder's ¾-ounce, 1-foot-wide flying triangle resembles new experimental military aircraft.

By Jack Wilson

WOULDN'T you get a boot out of seeing a jet plane that you had built yourself zoom into the sky? This model will give you that thrill—and something more. You'll have the kick of working from a design based on the delta wing, currently among the hottest experimental-aircraft ideas.

Launched with a rubber-band catapult, it whistles up some 50 feet. Then the jet engine takes over and boosts the altitude an-



How engine works. A wire-gauze disk holds the coiled wick against the fuel pellet. Four or five seconds after you light the wick, it sets off the fuel. Combustion generates gases that are forced out the jet at very high speed.

FIN

BUTT JOINT 3" WIDE BALSA

WING
HALF-PATTERN

3/8" No. 2 WOOD SCREWS

STABILIZER LINE

1/32" STEEL WIRE

WING AND FIN, CUT FROM 1/16" × 3" QUARTER-GRAIN BALSA. FUSELAGE CARVED FROM LIGHTEST 1"×1"×12" BALSA

FULL SIZE PATTERNS

FUSELAGE
TOP TEMPLATE

FUSELAGE
SIDE TEMPLATE

other 50 or 100 feet in swift 100-foot spirals. The flight distance averages 1,000 feet, with 2,000 not uncommon.

Its engine is a Jetex 50, an English product distributed here by American Telasco Ltd., of New York. It burns a non-explosive gas-producing pellet of guanidine nitrate.

Complete with engine, the 12″ model weighs ¾ oz.

Building the model. Trace the wing and fin on 1/16″ balsa, using the accompanying full-size drawings. Cut with a single-edge razor blade or sharp knife. Sand both sides smooth and round off edges. Support the sandpaper with the flat of the hand, rather than a block, to prevent scoring fine grooves in the surface.

Lay out the fuselage on the balsa block so the flat sides correspond to the straight surfaces that contact the wing. After sawing the two pieces to shape, coat the joining surfaces with cement, allow it to dry, then recoat, and pin the parts together until set.

Slip-in wings are not recommended because the high speed requires rigid cementing of the wing to the fuselage.

Form a catapult hook and loop from 1/32″ steel wire. A 10-foot strand of ⅛″ flat model airplane rubber makes a good beginning catapult. Later, you may want to try two strands or a loop.

Finishing. Sand the model all over with fine paper. Used dry, No. 400 waterproof paper works fine.

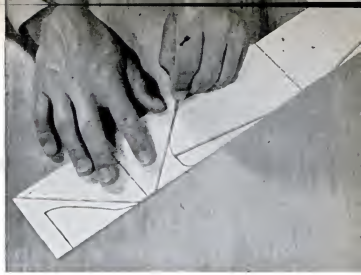
Apply several coats of colored dope diluted with an equal amount of thinner. Orange yellow is attractive and highly visible against either sky or foliage. An all-over coat of fuel proofer will give the model a dressy finish without adding much weight.

Is it safe? In flight, the engine case may reach a temperature of 260° F., and must be allowed to cool before handling. The manufacturer claims the jet gases do not reach flame temperature. I have found, however, that the hot case and gases of my model scorch anything they contact. Nevertheless, this model is as safe to operate as anything involving matches and flame.

Just be sure to start flights at least 300 feet from any building or dry grass.

Glide-test it first. If possible make your tests—as well as the later power flights—on a grassy field to avoid damage to the model.

Flex the wing trailing edge up to correct for too steep a glide. Add weight to the nose to correct a stall. Use rubber bands or



Cut wing parts and fin from a strip of 1/16″ by 3″ quarter-grain balsa. This is stiffer, smoother, and more speckled than ordinary balsa. Its use is a must for a warp-free wing.

Slice off stabilizers, bevel edge slightly, and cement back on with rear edge raised ⅛″. Manicure boards are handy for such beveling. Butt-join the two wing sections with cement.

clay for temporary balancing, and embed equivalent metal weights for permanent correction. For a slight turn, raise the trailing edge on the side toward which you wish the model to turn.

Preparing for a flight. Attach your catapult to a five- or six-foot post, and release the model from near the ground, holding it near the fuselage between the thumb and index finger. Try this out before you attempt a power flight.

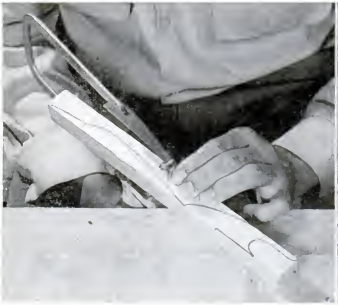
Bank the model opposite to the natural turn direction, and it will go into a spiraling climb, finally rolling into a gliding turn in the opposite direction. A one-length stretch of the rubber is right for the first catapult attempt. Later, for greater speed, you may increase this to three or four times the unstretched length.

Always insert the engine into the clip in

the same position to avoid changes of the thrust line.

And finally a power flight. Prepare for a catapult launch in the usual way. An instant before releasing the plane, light the wick. A convenient way of doing this is with a burning piece of common chalk line.

The plane may slow down a bit before the jet starts to push. But when it does, you will see sudden acceleration, and the model will shoot away at dazzling speed on your first jet flight. END



Use lightest balsa you can find for fuselage. Top and bottom sections are both cut from one 12" length as shown here. Jigsaw the pieces just outside the line. Then sand smooth.

Carve fuselage to follow the top template after cementing the two pieces together and marking a center line at top and bottom. Streamline with coarse, medium, and fine paper.

Using a twist of sandpaper, smooth ⅛" screwdriver-access holes drilled in the belly skid. Cement fin and tow hook in place with double coating for strength. Sand fin to airfoil section.

Attach the engine clips after cementing wing to fuselage. Substitute ⅜" No. 2 wood screws for those that come with engine. These will hold better. Avoid tightening screws too much.

Decorating. Outline cockpit with a small brush, using black or aluminum dope. Fill in remaining area. Apply fin decals of your own choice. Protect with coat of hot-fuel proofer.

Flying tip. For sure-fire ignition, tamp wick tightly against charge and avoid sharp bends in wick. Keep protruding end of wick less than ⅛" long to prevent spark damage.

Mother Will Appreciate Woodwork Like This

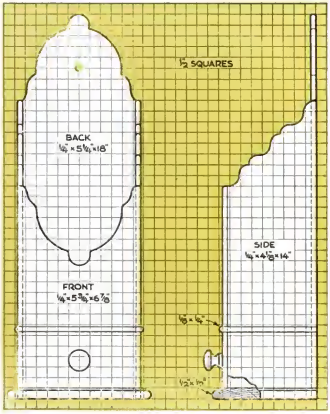
This copy of a Colonial wall box for clay pipes makes an unusual ivy holder.

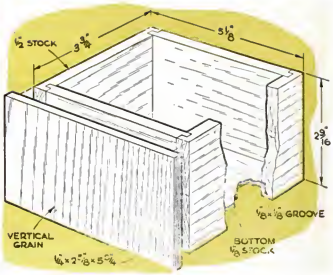
THE American colonists used decorative boxes like this to hold their long-stemmed clay smoking pipes. An authentic reproduction makes a handsome plant holder and the little drawer is a handy cache for house keys, playing cards, stamps, or other small items. Hence, it's a welcome Mother's Day gift.

In colonial times, the pipe box was a valued possession and often was made of fine mahogany, black walnut, or selected maple. I used old pine boards, resawed to ¼", to make the one shown here, but any ¼" wood will do.

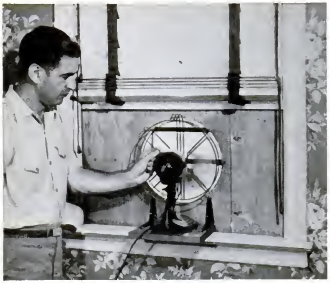
The patterns given for front and back are half-patterns, to be laid out on both sides of a center line. Any conventional method of drawer construction can be used, but be sure that the grain of the drawer front runs vertically to match the wood above it. Use a drawer pull of matching wood, or brass.

Glue and brad the parts, and then round and sand all edges on the face of the box. Finish with water-thin coats of shellac, well rubbed down, and polish to a fine gloss with a wax polish.—*J. P. Arnold, Doylestown, Pa.*

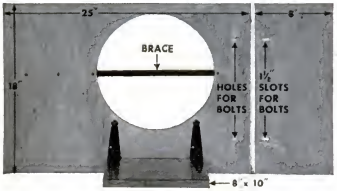




Wood Frame Supports Fan in Window



THIS summer put your bedroom fan where it will do the most good—in a window. You can mount it in a simple frame of ⅜″ or ½″ plywood as shown below. The dimensions are for a 31″ window and 12″ fan, but they can be easily modified to fit other sizes. Make two overlapping sections and rout slots in the smaller one so the frame can be inserted in the sash channel, widened, and locked in. Bolt the fan to a baseboard and attach the base to the frame with shelf brackets. Cushion the bottom of the base with a sheet of felt. Varnish the frame and join the sections with brass bolts and wing nuts. Run the fan at low or half speed.—*Robert Hertzberg, Jackson Heights, N.Y.*



Dust Mask Is Lightweight

THIS ½-oz., 30-cent mask protects the nose and throat of workers employed where nontoxic dust is a hazard. It has an aluminum shield, adjustable headband, and replaceable filters. General Equip. Co., Phila., makes it.

Coffee Can Is Workshop Ash Tray

NEED a man-size ash receiver for your workshop? Use a coffee can. Make a lip by snipping two 2″ slits and bending out the cut section. Double over the sharp edges. Water or sand in the bottom will extinguish your smokes and also weight the can.—*G. Breuker, Brooklyn.*

Parallel Bar Made from a Ladder

A PARALLEL bar can be made from an extension ladder cut into three pieces and then braced and bolted together. Legs should be bolted to stakes driven into the lawn. The small platform below this one helps little Martha Buck, of Ainsworth, Iowa, reach the bars. She won't need it when she's taller.

My Most Ingenious Solution

Maybe you have this same problem in your home: a 15-month-old toddler (persistent too) who likes to open cupboard doors. I solved the problem of keeping them closed very simply—without secret catches. What did I do?

I put two ordinary cupboard latches on each door, spaced as far apart as possible. The child can't open the doors because he concentrates on only one latch at a time.
—Theodore Hall, Willoughby, Ohio.

How to Make Dutch Doors

Their swinging halves add charm and convenience to a home.

You can make your own for much less than you can buy one.

Here's a choice of two.

This one's challenging . . . See the next three pages for instructions on how to make it.

This one's easy . . . and fine for a modern home.

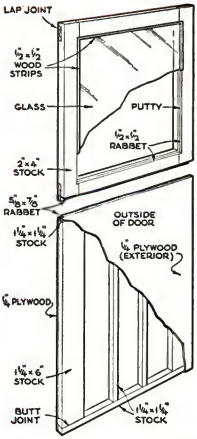
FOR the lower section, cut a piece of ¼″ outdoor plywood to the width of your doorway and the height at which you want the break. Cut a second piece ⅝″ shorter. Build a frame for this lower section of 1¾″ square stock, rabbeting the top member ⅝″ by ⅝″. When the ¼″ inside panel is added to this, you'll have a ⅝″ by ⅝″ rabbet. Cut a corresponding one of the same size in the bottom rail of the upper door half.

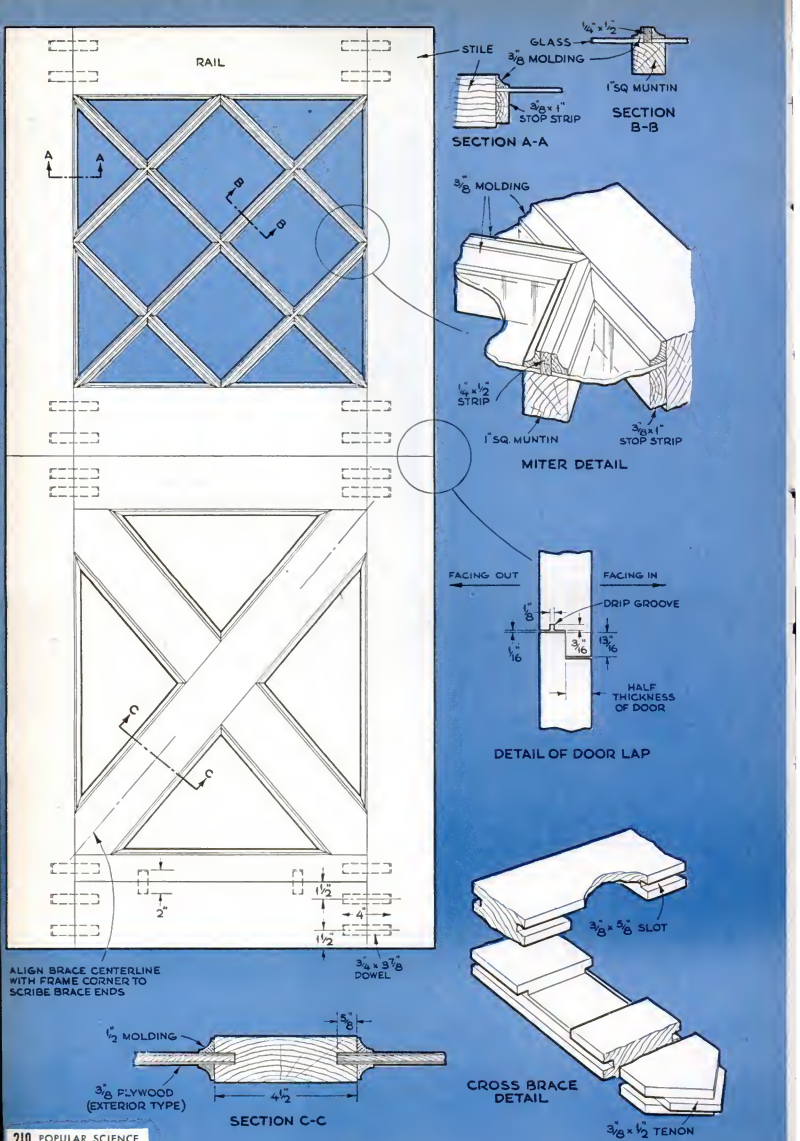
Assemble the frame with waterproof glue and nails. Then glue and nail the plywood to both sides of the frame, setting and filling over the nails.

Upper section. This consists of four pieces of two-by-four, lapped together. Cut a ½″ rabbet ½″ deep around the inner edges on the side that will face outward. The glass goes here. Cut ½″ by ½″ wood strips to hold it in place.

Hanging the door. Work with the door as a unit so far as possible. Install a vertical latch bolt on the inside to lock the two halves together. Use a pair of butt hinges on each section. Dress off the outer edges as necessary to make the door fit perfectly.

Glazing. Use double-strength glass. After you are sure the glass fits, apply putty all around the rabbet. Bed the glass against the putty. Set the wood strips in place and nail them to the frame, driving the nails in parallel to the glass.




RAIL
STILE
A
A
B
B
C
C
2"
1½"
4"
1½"
3/16" x 3 7/8" DOWEL
ALIGN BRACE CENTERLINE WITH FRAME CORNER TO SCRIBE BRACE ENDS
1/4" x 1/2"
GLASS
3/8" MOLDING
1" SQ MUNTIN
3/8" x 1" STOP STRIP
SECTION A-A
SECTION B-B
3/8" MOLDING
1/4" x 1/2" STRIP
1" SQ. MUNTIN
3/8" x 1" STOP STRIP
MITER DETAIL
FACING OUT
FACING IN
DRIP GROOVE
1/8"
1/16"
3/16"
13/16"
HALF THICKNESS OF DOOR
DETAIL OF DOOR LAP
1/2" MOLDING
5/8"
3/8" PLYWOOD (EXTERIOR TYPE)
4 1/2"
SECTION C-C
3/8" x 5/8" SLOT
CROSS BRACE DETAIL
3/8" x 1/2" TENON

This Diamond-Light Door Displays Craftsman's Skill

TAKE measurements from your old door, allowing ⅛″ extra on each side for final trimming. Allow 13/16″ more in the length of all stiles to compensate for the lap of the top and bottom sections. For good proportions, make the top section a bit shorter than the bottom.

Cut the stiles and rails to length and square the ends. Lay out all parts on the floor in proper position, recheck for length, and mark adjoining pieces. In the drawing you'll notice that a 2″ widening strip is doweled to the top of the bottom rail for an over-all width of 8″.

Drilling for the dowels. Accuracy is important in drilling holes for the dowels. If possible, use a doweling jig for this step. After cutting the dowels to length, clamp the rails and stiles together for a dry run to see if you have a perfect fit.

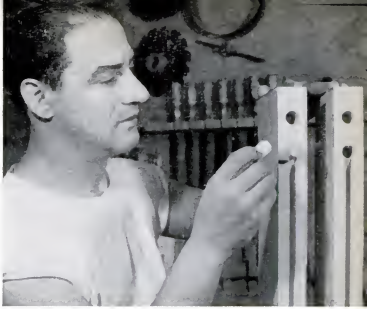
Then take the bottom section apart and cut ⅜″ by ⅝″ grooves on the center of the inner sides of the stiles and rails. Reassemble the section to cut the cross braces. Rip these 4½″ wide from the 2″ by 6″ stock.

Fitting the cross braces. Take measurements directly from the assembled framing. Draw a center line down the middle of each piece and line this up with the frame corners. Next, scribe in the corners with a knife (not a pencil). Then scribe lines where the two braces cross. Identify each piece and corner with matching marks before cutting.

Now draw lines ½″ beyond and parallel to the scribed lines at the end of each brace piece. Cut on the new lines. This extra length allows for ⅜″ by ½″ tenons to secure the braces in the frame.

Half-lap the braces by cutting on the lines scribed where they cross. Be careful to get a neat fit on both sides. Run a ⅜″ groove ⅝″ deep along both edges of both braces and cut ⅜″ by ½″ tenons on all four ends.

Remove one stile and clamp the braces in place. Now place the entire assembly on top of your sheet of ⅜″ plywood and scribe the triangular panels. Add ½″ to the scribed



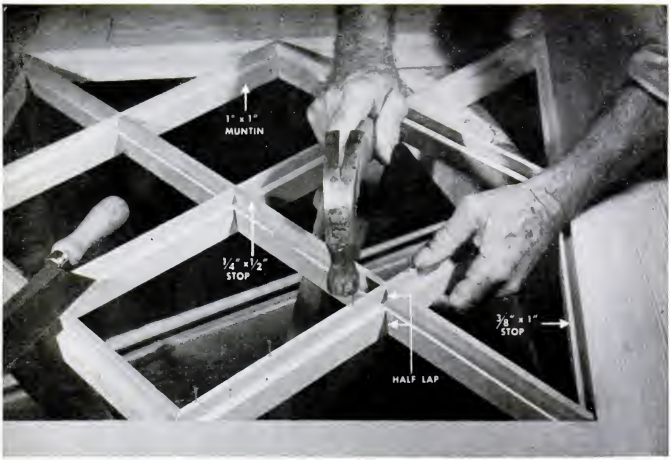
Cut ⅜″ slots ⅝″ deep in inner edges of the bottom-section stiles and rails. Run slots to rail ends. Stop them short in stiles (above).

LIST OF MATERIALS

38′ 2″ x 6″ stock	2½′ x 3′ panel ⅜″ plywood
24′ ½″ cove molding	4 4″ x 4″ loose-pin hinges
40′ ⅝″ cove molding	1 door lock, 1 latch.
6½′ ¾″ maple or birch dowel	

Plywood wedges fit into bottom panel as shown at right. Notice that outer edge of each wedge aligns with the tenons cut on ends of the braces.

Miter the cove molding into the bottom panel and nail the pieces in place after removing your clamps and dressing off excess glue and any high edges.



Half laps join the muntins and stop strips at points where they cross. Careful mitering is required where the ends join the outer framing. Glue and nail the stops in place.

line around each triangle. Cut on this new line. Assembly with glue and addition of molding then completes the bottom section.

Making the upper section. Glue up the rails and stiles of the upper section before cutting the framing for the diamond lights.

On the outside of the door, 1" by 1" muntins frame the diamond-shaped panels of glass. On the opposite side, the glass is retained by stop strips and molding.

Rip the muntins and stop strips from waste left from the 2" by 6" stock. Frame the inside of the opening with ⅜" by 1" strips. Then fit 1" by 1" muntins diagonally from corner to corner, half-lapping in the center. Next locate the exact center of each stile and rail. Cut the shorter muntins so the ends are lined up with these center points. Half-lap the short muntins across the long ones.

Glue all the half laps and glue and toenail the muntins to the frame with finishing nails, set and filled. The ¼" by ½" strips that run down the center of the muntins and separate the glass can be cut and fitted much like the muntins.

Cut single-strength glass to fit the sections. Then very carefully miter the cove molding. A bevel square will help a lot in this. No putty is used, the molding being cut to a tight fit and pressed into place while nailing. When you paint the door, flow the paint into the joints.

Lapping the sections. After cleaning up both top and bottom sections of the door, make cuts for the lap where the two come together. Details are shown in the drawing.

Place a 1/16" spacer in the lap, fasten the units together with battens, and hang both units as a single door, fitting the top and bottom hinges first. Trim the edges.

Apply a sealer such as Rez or Firzite and paint the door as desired. A tubular barrel-type lock with brass fittings was used on the door shown. END

Do you overpay when you shop for wood? See "How to Buy Lumber" next month.

Shade Covers Drawing Board

KEEPING my drawing board covered with newspapers or wrapping paper proved to be a nuisance. But a discarded window shade solved the problem of keeping dust off the board. I trimmed the shade to size and attached the roller brackets to the back of the drawing board.—*H. D. Cousins, Chicago.*

Raise a Flag this Summer

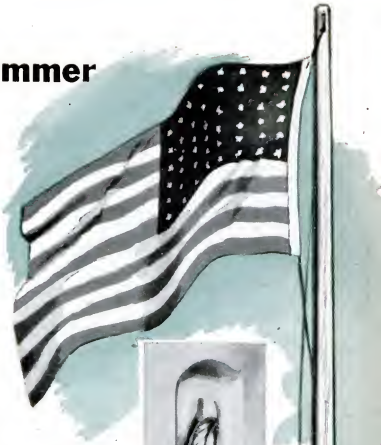
This two-part pole is easy to raise —and will serve for many summers.

HERE'S a flagpole you can put up and take down almost as easily as you raise and lower the flag itself. The pole was designed for a summer home or cottage.

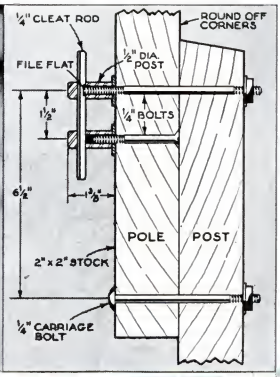
It has two parts—a short post or "deadman" to be left permanently in the ground or atop the building, and a removable pole, bolted in place. Storing it away at the end of the season is no trouble, and reduces the chances of damage.

Both parts were made of 2" by 2" stock. The post was left square, but the corners of the pole were planed off. The post was painted, the pole varnished.

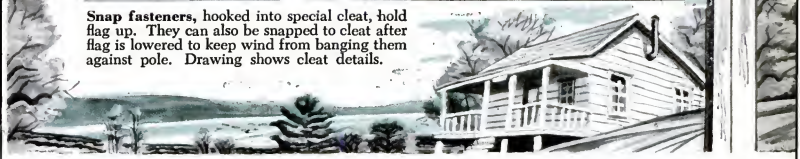
Because a suitable cleat was not available, a special one was made. One of the cleat bolts goes through only the pole. The other one and a regular carriage bolt hold the pole to the post. Cleat posts were made by drilling and tapping ½" rod. A flat filed on the cleat rod keeps it in place when the bolt is tightened.—*John M. Avery, Dexter, N.Y.*



A wheel from an awning pulley is mortised into the tip of pole. This helps keep the rope from fouling.



Snap fasteners, hooked into special cleat, hold flag up. They can also be snapped to cleat after flag is lowered to keep wind from banging them against pole. Drawing shows cleat details.



Its legs are made of rolling pins, coat hangers, and salad bowls.

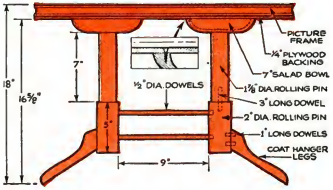
Ready-Made Parts Cut Cost of Table

If you need furniture for your summer cottage, why not make some yourself? This coffee table can be constructed with hand tools from parts already shaped and turned.

For pedestals and legs, you'll need two rolling pins, each at least 7″ long, one rolling pin at least 10″ long, two wooden coat hangers, two wooden salad bowls, and some ½″ doweling for stretchers.

Saw the large rolling pin into two 5″ lengths and file two flat areas on each piece where the legs will join. If they are longer than 7″, cut down the small rolling pins. Saw hangers in half for legs, as at right. Cut the doweling into stretchers 9½″ long. Dowels for joining the parts may be taken from the hanger crossbars. Bore the dowel holes, apply glue to dowels, holes, and end surfaces, and join the parts. Screw the bowls to the pedestals.

A picture frame backed with ¼″ plywood makes the top. Upend the base, locate it on the plywood, and outline the bowls. Using these marks as guides, drill and countersink screw holes in the board so the screws enter the bowls, as shown in the drawing. Then brad and glue the frame to the plywood.

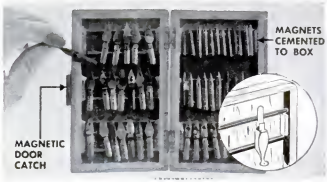


Holders Keep New Fuses Handy

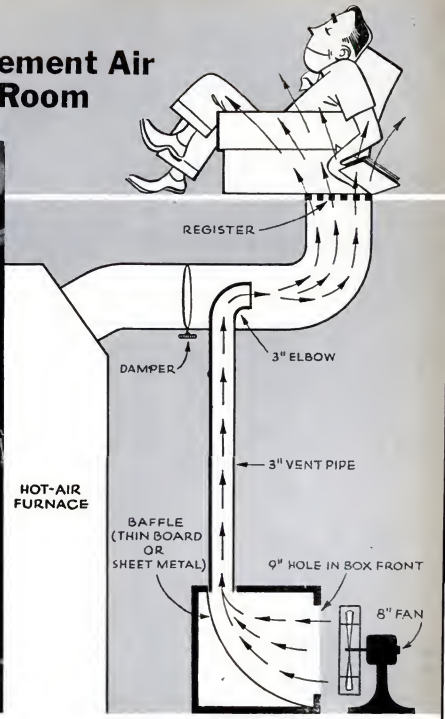
You won't have to hunt in the dark for new fuses if you keep replacements near the fuse boxes in holders like those below. For plug fuses, drill 1″ holes in a piece of ¾″ stock; for the cartridge type, make ⅞″ blind holes in a strip of 1″ by 1″. Empty holes will serve to remind you when your supply is running low.—*Walter Haase, Wethersfield, Conn.*

Drawing-Pen Rack Is Magnetic

You can keep your drawing and lettering pens neatly arranged in a box by using small magnets and some lengths of iron wire, such as straightened-out paper clips. Cement the magnets to the sides of the box and place two wires across each pair. Attach another pair of magnets to the outside of the box to act as a door catch.—*Andrew Brennan, Philadelphia.*



Fan-Driven Basement Air Cools Upstairs Room



HAVEN'T you sometimes wished you could spend sweltering days in the coolth of your basement? Ray Millholland, of Indianapolis, brings that refreshing air from his basement to cool a room on an upper floor. His simple "air conditioner" can be installed in a couple of hours in any house that has hot-air heating ducts. Besides cooling the upstairs room, it reduces basement humidity.

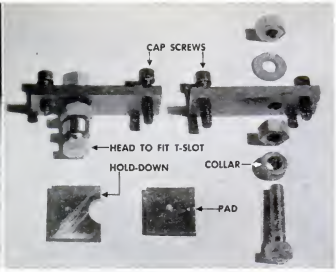
To duplicate his setup, you'll need an 8" electric fan, a few lengths of 3" vent pipe with an elbow, and a 12" by 12" by 12" wooden box. Make the box with a 9" hole in one side and a curved baffle facing the hole to deflect the fan stream toward the top of the box. Cut a 3" hole in the top.

Fit the vent pipe into this top hole, as shown in the drawing, and into the air duct leading to the room you wish to cool. Run the pipe in as straight a line as possible to minimize resistance to the air flow through it. Put on the elbow, inside the duct, facing toward the room. If necessary, install a damper in the furnace side of the duct to keep the cold air from leaking back into the furnace.

An old vacuum-cleaner unit can be rigged up to the vent pipe instead of the fan box. Such a blower unit may run too fast, with objectionable noise, but you can slow it down by connecting a lamp bulb in series with it.

The fan unit shown draws less than 100 watts and lowers the temperature of a second-floor room by 3° to 5°. END

New Shop Ideas



A wedgelike grip against the edges holds work firmly for milling. The table shown is for use with a milling attachment mounted on a lathe.

Hold-Downs for Milling. When a milling cutter must run clear across the work, ordinary clamps may interfere. The hold-downs shown grip the work firmly at the edges and do not project above it.

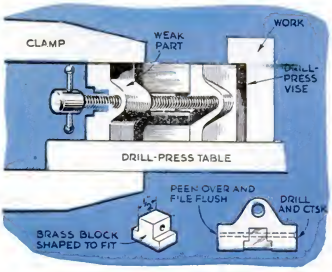
Each clamp calls for a plate with a bolt that enters a T slot, a collar, and two nuts, plus a piece of flat steel having a radius machined in one edge that matches that of the collar. The plate must be tapped for cap screws at both ends.

With the studs tightened in the table slot a suitable distance apart, the hold-down plates are set against the collars and propped against the edges of the work. The outer setscrews, with pads underneath, are turned up snug. Then the inner screws are tightened against the sloping plates (the photo at left above shows them only partly pulled down) until the plates wedge the work firmly.—*Joseph Tracy, Manhattan.*

Sharpener Deburrs Edges. If you work sheet metal, this gadget is handy for taking the razor edges off sheared sheets. You can buy the main part — a disk-type knife sharpener — at any dime store.

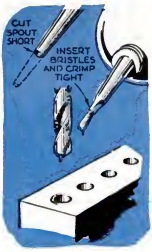
Drill a ⅜″ hole about 2″ deep into a file handle. Cut two strips of sheet metal ⅜″ by 3″, drill a hole near one end of each, and bend at 90° about ½″ from the hole. Then squeeze the long leg of each in the vise jaws to bend it up the middle as shown. Bolt or rivet the pieces to the sharpener and force the legs together into the handle.

To use the tool, simply draw it along the edge.—*Will Thomas, Buffalo.*



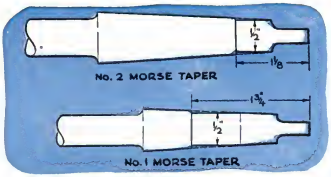
Spare the Drill-Press Vise. When you have to turn a drill-press vise on its side, with a clamp on its end as above, every twist of the clamp handle endangers the weak neck bridging the slot. A little too much muscle may crack the vise.

The little brass block shown is good insurance against this kind of damage. With it, you can clamp your vise as tightly as necessary with no fear of cracking it. Mill or file the block to a tight push fit. Drill across the vise for a brass pin to secure it.—*Herbert Pfister, The Bronx, New York.*

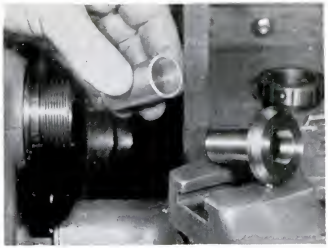


Coolant Brush. I found it annoying and messy to apply coolant on a long drilling job until I made a brush from an oil can. Cutting the spout short, I inserted some bristles, crimped the tip to hold them, and put coolant in the can. A swipe or two on the drill, whenever it was raised to clear out chips, wiped them off the flutes and supplied just enough fluid, but not so much as to splash it around and be troublesome.—*Albert Jusak, Cleveland.*

Quickie Drill Gauge. In grinding larger drills, you can check lip angles with two clean, new hex nuts. Line them up against a straightedge with the inside flats touching. Although the included angle is 120° instead of 118°, this is close enough for all practical purposes. —*Will Thomas, Buffalo.*



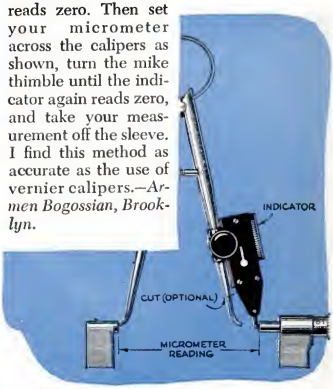
Chucking Taper Shanks. You can use drills and reamers having Morse-taper shanks in a regular chuck without spoiling them for use in a taper spindle. Grip the tool in the lathe chuck close to the shank, with the taper projecting, and support it with the tailstock center. Then turn a section of the taper to the maximum diameter the drill chuck will take. The drawing shows two sizes adapted for use in a ½″-capacity chuck. For safety when working with such adapted tools, use low spindle speeds and clamps.—*Bernard J. Corey, Thorold, Ont.*



Collets Hold Stops. With a collet behind the lathe chuck, you can hold stops to locate work accurately for duplicate facing, turning, or cutoff operations. The stop need be only a short piece of stock.

The standard collet adapter has a big shoulder to facilitate its removal from the spindle. This shoulder prevents mounting a chuck. The answer is either a new adapter made without a shoulder, or another adapter with the shoulder removed. Insert it and the collet, mount the chuck, and position the stop inside, clamping it with the drawbar.—*J. C. Magee, Schenectady.*

Measuring Bores. Ordinarily, calipers are set to inside diameters, and the measurements are then read with an outside micrometer, with a probable loss of accuracy. This is eliminated if you clamp a midget indicator to one caliper leg. Adjust in the bore so that the indicator reads zero. Then set your micrometer across the calipers as shown, turn the mike thimble until the indicator again reads zero, and take your measurement off the sleeve. I find this method as accurate as the use of vernier calipers.—*Armen Bogossian, Brooklyn.*



Kids always manage to get mitts, gloves, balls, and bats. Here's how you can give them bases and a diamond.

SAND-LOT baseball diamonds are, in many cases, makeshift affairs. They are roughly laid out and pieces of wood or bricks serve as bases.

But it's easy to give the young players in your neighborhood real bags for bases and a real home plate and pitcher's plate. Laying out a diamond is simple. The drawings on the opposite page give you the dimensions for both a baseball and a softball field.

Instead of the surplus utility bag shown in the photos below, you can use a gas-mask bag. Or you can sew up a bag of heavy canvas. Upholstery moss is excellent for stuffing the bases.

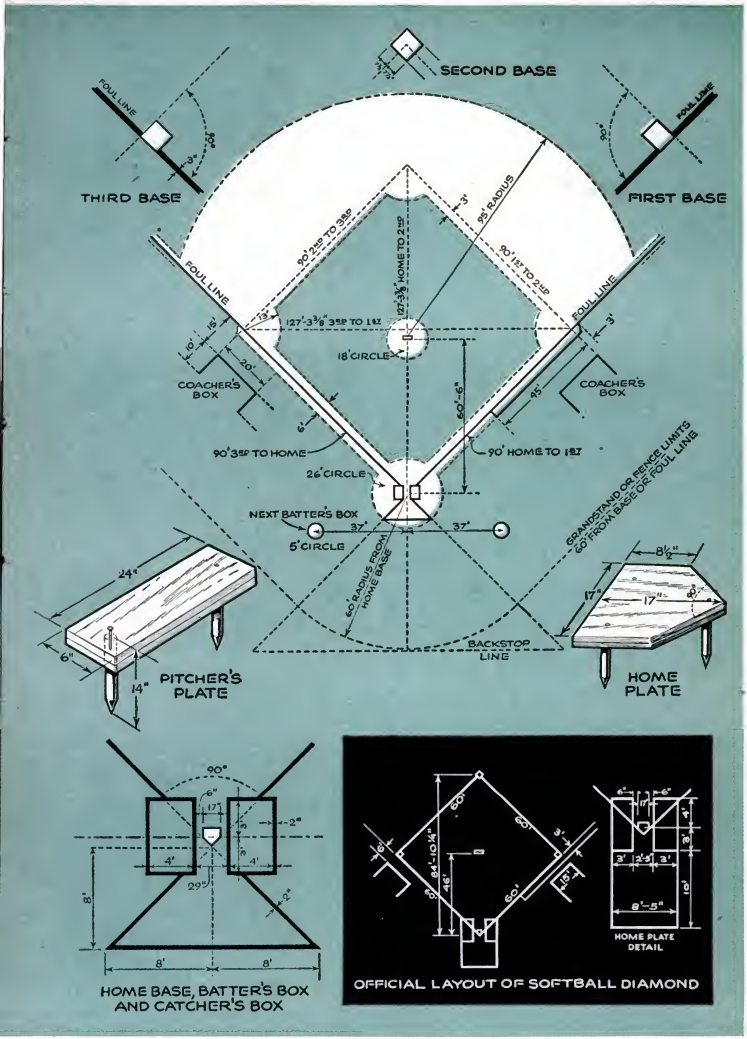
The bag shown below is about 10″ by 14″ and about 5″ thick. Baseball rules specify a bag 15″ square and from 3″ to 5″ thick. But small feet do not require that large a bag.

Home plate and the pitcher's plate are each made of two pieces of ¾″ plywood held together with nails and glue. For the spikes that hold the plates in place, use sharpened pieces of broom handle or big dowels. Bore holes for the spikes through only one piece of the plywood. Drive a nail down through the other piece into the head of each spike.

An old Army utility bag can be converted into a sturdy base.

Stuff the bag tightly with upholstery moss. Don't remove any of the tie straps or the carrying strap until after sewing. With one corner sewn shut, pack moss tightly into corners.

Sew the bag with heavy thread. A curved upholsterer's needle makes the job easier. Cut off carrying strap and sew it around bag. Grommet is used to tie bag to stake driven in ground.


SECOND BASE
THIRD BASE
FIRST BASE
FOUL LINE
90°
3"
95' RADIUS
90' 2ND TO 3RD
90' 1ST TO 2ND
127'-3⅜" HOME TO 2ND
127'-3⅜" 3RD TO 1ST
18' CIRCLE
COACHER'S BOX
COACHER'S BOX
60'-6"
45'
90' 3RD TO HOME
90' HOME TO 1ST
26' CIRCLE
NEXT BATTER'S BOX
5' CIRCLE
37'
37'
60' RADIUS FROM HOME BASE
GRANDSTAND OR FENCE LIMITS 60' FROM BASE OR FOUL LINE
BACKSTOP LINE
24"
6"
14"
PITCHER'S PLATE
8½"
17"
17"
HOME PLATE
90°
6"
17"
2"
4"
4"
29°
8'
8'
8'
HOME BASE, BATTER'S BOX AND CATCHER'S BOX
60'
60'
60'
84'-10¼"
46'
15"
6"
6"
17"
4'
3'
3'
2'-3"
3'
10'
8'-5"
HOME PLATE DETAIL
OFFICIAL LAYOUT OF SOFTBALL DIAMOND

Board Hooked to Window Serves as Bird Feeder

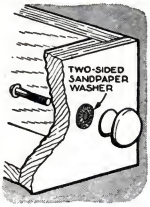
A WINDOW-LEDGE bird feeder can be made from any fairly light, wide board—a sheet of ¾" waterproof plywood is ideal. This one is held in place by two hooks and a pair of corresponding screw eyes in the sill. Nail a batten to the underside of the board where it will bear against the window frame and steady the tray. And tack strips of molding around the top edge to keep the seed from scattering. Finish with an outdoor paint if desired.—*L. G. Gibson, Oakton, Va.*

Emery Cloth Makes "Knurled" Knob

IF A thumbscrew or knob is too smooth to afford a good finger grip, cement a strip of abrasive cloth around the rim with any good cloth-to-metal cement. The photo at left shows how the ends of the cloth are cut to form a strong, neat diagonal joint.—*Walter E. Burton, Akron, Ohio.*

Washers Keep Drawer Knobs Tight

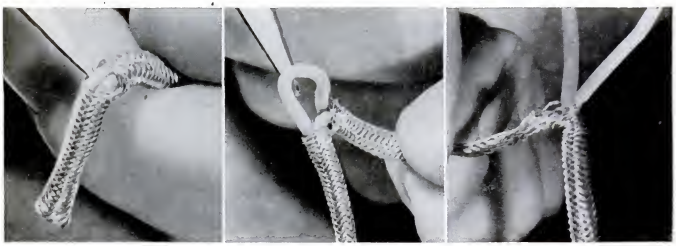
DRAWER knobs won't work loose if you insert washers cut from sandpaper between the knobs and the drawers. Glue two sheets of fine or medium sandpaper back to back. When the glue is dry, scribe circles of the required size with the point of an old compass or dividers, and cut them out.—*Arthur Trauffer, McClelland, Iowa.*



How to Make Quick, Clean Connections with Shielded Wire

WHEN you use shielded wire in your electronic hookups, you can save yourself time and get better, cleaner results by separating the inner conductors from the braid as shown in the photos below.

First, bend the wire double and spread—don't cut—the braid with a sharp pick. When the inner wire or wires are uncovered, pull the braid straight to prevent binding and work the first wire back through the hole (center photo below). Finally, twist the braid a couple of times to stiffen it. If it's too flimsy, flow solder on it. Use braid for ground connection.



How to Improvise a Signal Generator

You can align radio circuits with a record player and another radio set.

WHEN you build or service a superhet receiver, you often run into the problem of aligning its circuits so that they will work together properly. Professionals do this with a signal generator, but it can be done if necessary by simply "borrowing" the right frequencies from a working set and using them to adjust the ailing one correctly.

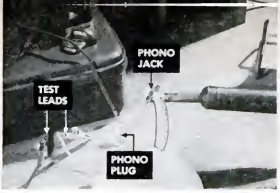
Audio test. To be sure the trouble is not in the audio part of the set you are working on, you need a source of audio signals. Although these can be tapped off a "healthy" set, it's easier to get them from a record player, which supplies a clean audio signal of the right impedance and voltage. The leads from the record player that ordinarily are connected to an amplifier are used. If your player has a phonograph plug, you can separate the two leads by soldering short wires to the contacts of a matching jack.

Connect one of these leads to the chassis of the radio you wish to test and start the record player. Then connect your other lead to the grid of the output tube (point *A* in diagram on next page). If you're not sure which tube-base pin goes to the grid, check it in a tube manual. If you hear the record through the radio's speaker, the output stage, speaker, and power supply are functioning. Checking similarly at the grid of any other audio tube in your receiver (such as point *B*) will tell you whether that part is working properly.

I.F. alignment: You can then proceed to align the intermediate-frequency stages with another radio. It should operate at the same I.F. frequency as the set you wish to align. Nearly all superhets now have standardized 455-465 kilocycle I.F. circuits.

If both sets are AC-DC types, you should be sure that their power plugs are polarized the same way to avoid shorts. Plug in and turn on both sets, and connect a neon tester across the two chassis or grounds. If the tester lights up, reverse one of the line plugs. Then see what happens when you connect the tester between one chassis and a water pipe. If the neon bulb lights, reverse the power plugs of both radio sets.

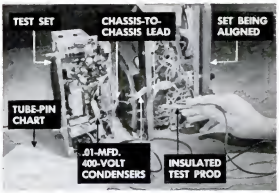
After plugging the sets in properly, tune in a strong station on the one that's operating. Don't bother tuning the other one, but connect the two chassis with a test lead in which a .01-mfd. 400-volt condenser has been inserted. Put a similar condenser in a second test lead and connect one



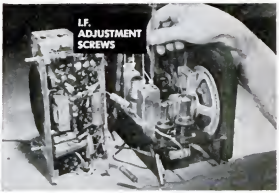
Making the test leads

Checking the audio circuits

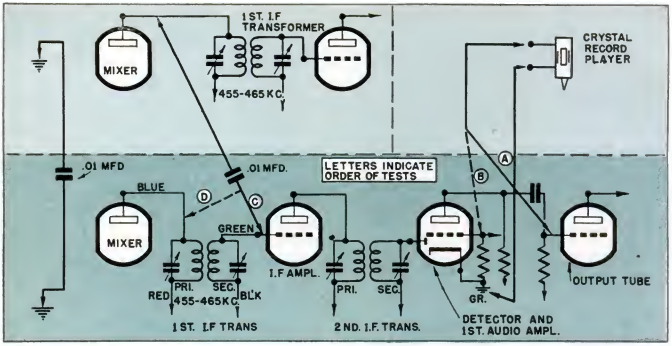
Using the neon tester



Feeding an I.F. signal



Adjusting the I.F. trimmers



end of the lead to the plate of the mixer tube in the operating receiver. Insulate the other end of the lead and touch the grid of the last I.F. amplifier tube (point *C*) in the set you wish to align with it.

With a small screwdriver or neutralizing tool (a non-metallic screwdriver), adjust the trimmer screws on the following I.F. transformer. Work first on the secondary trimmer, then on the primary. This changes the frequency of the transformer and, at some point, should allow sound to come through to the speaker of the set being aligned. Adjust trimmers for peak volume.

Move the test prod to the plate of the mixer tube (test point *D*) and adjust the trimmers on the first I.F. transformer. If the set you're aligning has two I.F. stages, (two tubes and three transformers) you have to align the extra transformer by repeating Step *C* on the middle stage.

Once you have adjusted the I.F. transformers for maximum response by this method, you can put aside your improvised signal generator and do the rest of the job by ear. (For further steps in tracking and aligning a superhet, see PS, March '51, p. 236).—*Joseph A. Saldana, Ft. Lee, N. J.*

DEGREE TABLE

The index head or bull gear on a lathe, used with this table, makes it easy to lay out degrees or divisions of circles. For instance, if you want six equally spaced divisions, and have a 72-hole index plate, the table shows that counting 12 holes each time gives you the proper location. The table can also be used with a gear having 72, 60, or 48 teeth.

72 HOLE CIRCLE No. of Holes	Deg. Div.	60 HOLE CIRCLE No. of Holes	Deg. Div.	48 HOLE CIRCLE No. of Holes	Deg. Div.
1	5	1	6	1	7.5
2	10	2	12	2	15
3	15	3	18	3	22.5
4	20	4	24	4	30
5	25	5	30	5	37.5
6	30	6	36	6	45
7	35	7	42	7	52.5
8	40	8	48	8	60
9	45	9	54	9	67.5
10	50	10	60	10	75
11	55	11	66	11	82.5
12	60	12	72	12	90
13	65	13	78	13	97.5
14	70	14	84	14	105
15	75	15	90	15	112.5
16	80	16	96	16	120
17	85	17	102	17	127.5
18	90	18	108	18	135
19	95	19	114	19	142.5
20	100	20	120	20	150
21	105	21	126	21	157.5
22	110	22	132	22	165
23	115	23	138	23	172.5
24	120	24	144	24	180
25	125	25	150		
26	130	26	156		
27	135	27	162		
28	140	28	168		
29	145	29	174		
30	150	30	180		
31	155				
32	160				
33	165				
34	170				
35	175				
36	180				

FOR YOUR POPULAR SCIENCE INFORMATION FILE

Your wife will appreciate dish racks . . .

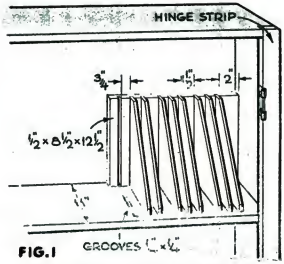


FIG. 1

built in newly constructed shelves or . . .

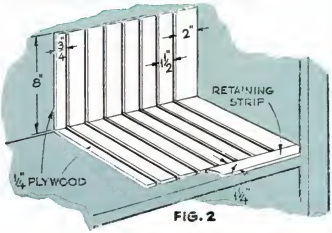
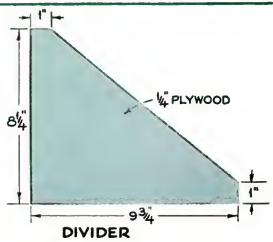


FIG. 2

. . . set into existing shelves this way.



Use these dimensions for the dividers.

How to Improve Kitchen Shelves

Dividers can be put in quickly by anyone handy with tools.

VERTICAL dividers on a kitchen shelf will make it easier for your wife to store platters and odd-size plates. Here are two ways to make them, using ¼″ plywood.

If the shelf can be removed, or in new construction, cut ¼″ by ¼″ grooves in the shelf for the bases of the dividers (Fig. 1). Support the dividers in corresponding grooves cut in a back plate notched into the shelf. Use ½″ stock for the back plate.

If you prefer not to disturb the shelf, you can make grooves by nailing in plywood strips (Fig. 2). Once the dividers are in place, a retaining strip keeps them there.

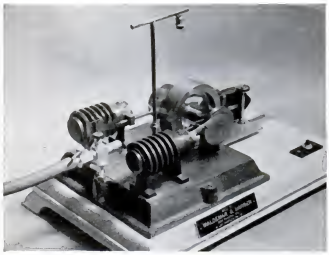
In either case, allow 2″ space between the cabinet wall and the first divider to allow for the slight overhang of the hinge strip. Vary the dimensions if your shelf is wider or narrower than the 11″ shown here.

New Plastic Surfacing Material Is Applied Like Linoleum

A NEW plastic surfacing material, called Versibond, has a flexible rubber backing. It is suitable for use on sink and cabinet tops or as wall paneling and can be readily bent or coved. Unlike the rigid laminates, it is applied by contact pressure with an ordinary hand roller. Scissors, a linoleum knife, or a coping saw easily cuts the material, which resists cigarette burns. The Ohio Rubber Co., Willoughby, O., makes it.

CRAFTSMEN AT WORK

Homemade Tractor. Clarence Sebring, of Altay, N. Y., built this little tractor from old parts. Sebring, shown in the driver's seat, uses the tractor on his farm. It's powered by a 2½-hp. Briggs and Stratton engine through an Indian motorcycle transmission and then through a Chevrolet transmission. It has a Model-T differential. The blade on the front can be raised or lowered hydraulically from the driver's seat. Steering is by brake levers.—*Richard Carpenter, Rochester, N. Y.*



Adds Cylinder to PS Hot-Air Engine. After Waldemar G. Hansen had built six copies of a hot-air engine described in POPULAR SCIENCE (Feb. '50, p. 206), I became the proud owner of one of them. I watched the engine run and then suggested that we add another cylinder. I made three patterns—a bigger base, heavier flywheel, and a reversed cylinder. Hansen did the rest. The two-cylinder job starts easier, runs smoother, and powers a generator from a hand lantern to light a 1½-volt bulb. A double-jet Bunsen burner supplies heat.—*James N. Doolittle, Los Angeles.*

Signs Made with Marbles. Roy E. Swain, Huntington Park, Calif., industrial engineer, uses marbles of different colors to make signs that glow like neon under artificial light or sunshine. The marbles are held between two pieces of wire mesh that are welded together at close intervals.—*Tom Cameron, Pasadena.*

Aluminum Home Is Dustproof. This Marion, N. C., home may be an answer to a housewife's dusting problems. Air-conditioning units filter all air that enters the sealed home. Windows are plastic. Designed and built by Thomas Edison Westall, the house is as spacious as a five-room home.—*Max Tharpe, Statesville, N. C.*

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without changing other tones

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Gus Tames a Runaway
[Continued from page 176]

look at the plugs. Could be they're dirty."

Starting at the front end of the engine, Gus began removing the spark plugs. As he lifted out each one, he shook his head.

"Not likely that it's pre-ignition," he reported as he screwed them back into place and replaced the ignition wires. "All of 'em are clean. And from what I could see squinting through the spark-plug holes, the piston heads aren't too fouled with carbon."

"Well, what now?" asked Ken.

Still Another Question

Gus scratched his head in thought. "Look, Ken," he said, "what I'm going to do next may take some time, so if you have anything else to do go do it. No sense both of us sittin' here fuming."

About half an hour later, Ken was giving one of his workmen some instructions about minor repairs to be made on the merry-go-round when he heard the Ferris wheel engine start up. After a few seconds it stopped. Then it started up again. Ken made off in the direction of the wheel on the double. When he got there, Gus was standing beside the engine, grinning from ear to ear.

"Find the trouble?" asked Ken, puffing.

Gus nodded. "Yeah, finally. It was a short all right, not in the switch but in the wiring. It was a tough one to find, too."

Ken reached over and turned the ignition. The engine stopped just as promptly as any well-behaved engine should.

"Where'd you find it?"

Gus pointed down to the side of the engine. "I went over all the visible wiring without finding a thing. Then I just happened to examine those two wires there where they enter that metal conduit that leads them by the block."

One Question Answered

Ken looked at the two wires Gus had indicated. They now were protected with fresh tape.

"The sharp edge on the hole in that conduit had cut through the insulation on both," Gus explained. "And if you'll follow them through, you'll find that one leads from the generator, the other to the coil. As a result there was a direct connection from the generator to the coil. So no matter what position the ignition switch was

[Continued on page 228]

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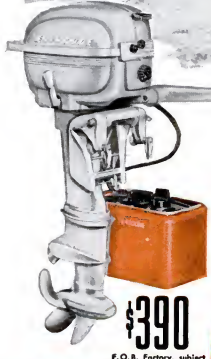

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Gus Tames a Runaway
[Continued from page 226]

in, the coil was always getting juice once the engine was started."

"Okay, but how come then she wouldn't start unless the switch was turned on?"

"With the engine dead, the coil could only get juice through the switch," Gus explained. "You see, the generator isn't even connected into the ignition circuit when you start an engine. The cutout—that's that gimmick mounted on top the generator housing—doesn't kick it in until the generator's turning fast enough to put out more juice than the battery does. Otherwise a battery would discharge back through the generator."

"I get it," said Ken. "So the short didn't feed the coil until the engine got up to speed."

"That's about it," agreed Gus. "And by the way, that tape will hold for now, but when you get a chance I'd put all new wiring in. Most of the insulation is brittle. You may want to replace the coil, too, though it seems all right. The generator may have kicked out enough juice to weaken the insulation on the primary."

"How much do I owe you, Gus?"

"Aw shucks," grinned Gus. "This is my day off. I'll take a raincheck on some rides this summer."

"Second childhood?" laughed Ken.

"Oh, not for me," replied Gus. "I've got a young niece coming to visit me in July and what kid doesn't like a Ferris wheel?"

END

Icebag Has Sealed-In Liquid

THIS lightweight plastic icebag contains a sealed-in solution, which, when frozen in a refrigerator, provides an ice-cold pack lasting about 45 minutes. Waterproof and washable Freezo is divided into 10 segments to make it flexible. It retails for $1.50, and is made by Pioneer Valley Plastics Co., Springfield, Mass.

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anyone can do it in his spare time and save real money!

You can have a floor like this in your kitchen for only $19.75*

Or one like this in your living room for only **$36.25***

Write for your FREE copy of the Kentile Color Booklet showing all of the sparkling, modern colors in low-cost Kentile Floors.

ANYONE can install their own Kentile Floor! The tough, durable squares go down one at a time . . . for just a small section or whole rooms at once . . . and colorful Kentile is ready for years of hard wear as soon as it's down. It's quick, easy, fun!

26 wonderful Kentile colors mean that you can create any design you want . . . match any plan. Kentile's ready-to-install decorative inserts make your own floor the only one of its kind.

And, when you've finished, you'll have an attractive floor that will give almost unbelievable service . . . modern colors that can't wear off because they go clear through to the back of each tile . . . simple and inexpensive to clean with just mild soap and water. And the fresh Kentile beauty needs only an occasional no-rub waxing to always look new.

**Price based on a 8' x 9' kitchen and on a 12' x 15' living room*

Your Kentile dealer's low price includes adhesive, instruction booklet and this handy Ken-Kit that contains all of the simple tools needed to do a neat, long-lasting job.

KENTILE.

The Asphalt Tile of Enduring Beauty

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Installing kitchen accessories!

HOME-UTILITY ¼" Electric DRILL only $22.95

Makes household jobs FUN for the whole family!

Sharpening cutlery!

Polishing cars!

Refinishing furniture!

Shining pots, pans!

You'll zip through home jobs—save on repair bills, too—when you add a Home-Utility ¼" Electric Drill to your home appliances! It's so easy to operate that the whole family can enjoy using it to build and repair things around the house. This handy fistful of power drives scores of attachments — twist drills, wood augers, masonry bits, sanding discs, polishing bonnets, wire brushes, light grinding wheels, buffing wheels, etc.—for everything from building cabinets to waxing woodwork!

Quality-built by BLACK & DECKER, world's largest electric tool maker. Operates on AC or DC. Weighs only 3¼ lbs. Comfortable pistol grip and trigger switch. Over a million sold. Try one at your hardware, appliance or department store. Or, if you already have one, be sure to ask for the many attachments that make your drill even more useful!

Products of HOME-UTILITY Div.,
BLACK & DECKER Mfg. Co., Dept. H5S, Towson 4, Md.

ELECTRIC HOME-UTILITY TOOLS

¼"-½" DRILLS • LECTRO-SAWS
SANDER-POLISHERS • BENCH GRINDERS

Mechanics of Farming

By Ladd Haystead

■ Because crop plants breathe during the daytime and rest at night, a new weeding technique to eliminate grass in cultivated fields has been developed in California. Light petroleum oils spread between the rows destroy the grass, but do not harm the growing crop. The reason for this is that the structure of grass is such that oil applied at any time will kill it. By morning, however, it has evaporated so that crop plants are not harmed by it.

■ One of the greatest hazards of farming is the harvest-time loss of crop--estimated by some as high as 50 percent--caused when rain comes at haymaking time or early freezes make the corn soft. Driers that appeared after the war were not satisfactory, but shown here is what may

be the answer. It is a portable jet drier that will handle better than 100 bushels of corn per hour. The machine has a GE jet and a Habco heat exchanger that develops about 30 percent more drying efficiency than previously obtainable. The machine can be adapted for overhead bins, batch, or continuous drying.

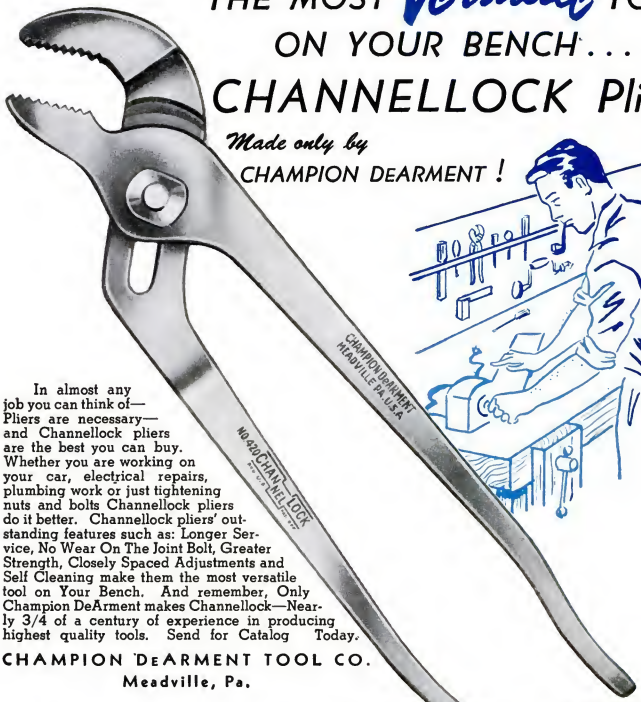
■ Isolated areas, where commercial power lines are uneconomic, may get a boost from a new power plant under development at Oregon State College. It is a portable turbine operating on gas generated by burning sawdust, hogged wood, or shavings.

■ Noted in this column last month was the destructive 15 B wheat rust. Fluorescent-lit greenhouses at the

THE MOST *Versatile* TOOL ON YOUR BENCH . . .

CHANNELLOCK Pliers

Made only by
CHAMPION DEARMENT !



In almost any job you can think of—Pliers are necessary—and Channellock pliers are the best you can buy. Whether you are working on your car, electrical repairs, plumbing work or just tightening nuts and bolts Channellock pliers do it better. Channellock pliers' outstanding features such as: Longer Service, No Wear On The Joint Bolt, Greater Strength, Closely Spaced Adjustments and Self Cleaning make them the most versatile tool on Your Bench. And remember, Only Champion DeArment makes Channellock—Nearly 3/4 of a century of experience in producing highest quality tools. Send for Catalog Today.

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Meadville, Pa.

Channellock pliers are listed in the Yellow Pages of most Telephone Directories under "Tools"

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The Mark of Superiority

MILLERS FALLS TOOLS

SINCE 1868

MILLERS FALLS COMPANY GREENFIELD MASS.

Mechanics of Farming

University of Manitoba are now forcing three growths a year to test a new type of wheat that will resist this damage. Hopes for it are high.

■ At the N.Y. State experimental station in Geneva, a machine familiar to roadworkers has been converted into a farm tool that will sterilize five cubic yards of soil in two hours. Two blowtorches mounted in a revolving drum eight feet in diameter destroy fungi that cause "damping off" of seedlings.

■ "It is the judgment of many scientists that if [plant] breeding research were to be discontinued, within a decade most of the varieties of crops now grown would succumb to diseases and the result might be starvation for millions of people," says Dr. R. M. Salter, Chief, Bureau of Plant Industry, U.S. Department of Agriculture.

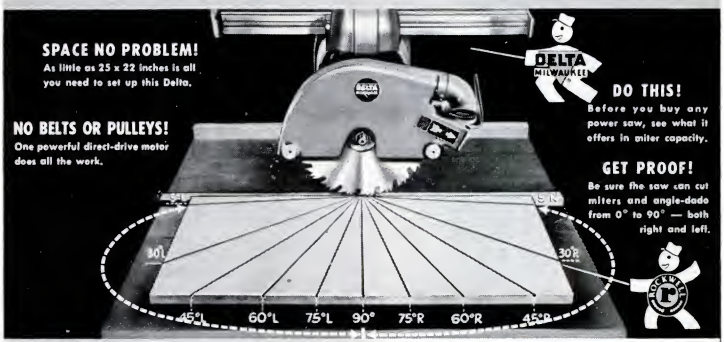
■ Adding high-purity oxygen to incubator air has improved the hatching of stronger and better-feathered birds in California and Utah. The theory is that eggs are starved for oxygen at higher altitudes. Further experiments will be carried on by the Linde Air Products Co. to see whether this treatment at sea level also will produce "two-day birds" at hatching.

■ Double-paned glass with a dry air space between to give insulation is gaining wide acceptance among farmers. According to Libbey-Owens-Ford Glass Co., it is being used mostly where controlled temperature and humidity is desirable, such as enclosures for livestock, poultry, and milking. In many instances a south-wall installation has been chosen to utilize solar heat.

■ Notice to flies who don't mind DDT: Coming your way is Allethrin, a synthetic that has all the killing properties of pyrethrum, but no prospective wartime shortages. Allethrin, it is claimed, will kill where alternative poisons won't. The Bureau of Entomology and Plant Quarantine says that the new synthetic will provide a reserve against possible shortages of pyrethrum, an oriental import.

NOT 5 TOOLS IN 1...NOR 10 TOOLS IN 1... BUT 100's OF TOOLS ARE YOURS

when you own this new DELTA SAW-SHOP



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4 sizes for hobby and industrial shops

Prices start at $229.50 including motor and blade Plus zone delivery charge (Subject to change without notice)

THE NEW DELTA

can do *more* jobs than any other all-purpose saw ever built!

Prove it to yourself in many ways: Start with the important miter test, as shown above . . . then measure the floor space you need . . . review the jobs you can do . . . check the time it takes to change set-ups . . . compare ease of operation and safety.

This Delta Saw-Shop cuts from above — you can follow layout marks easily. Even most beginners can do expert work from the start without trouble.

The Delta sets against the shop wall, out of the way. Material moves in a straight line on a level table, no matter what cut you make.

The Delta saves time, too. In just a few seconds, you change the cutter on the saw arbor — and have another efficient power tool. It's that fast!

Yes, feature for feature, job for job, the new Delta Saw-Shop is your best buy — comparison proves it! See your nearby Delta dealer today.

Tear out coupon and mail today!

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☐ Send me new Delta Book, "Unlimited Applications."
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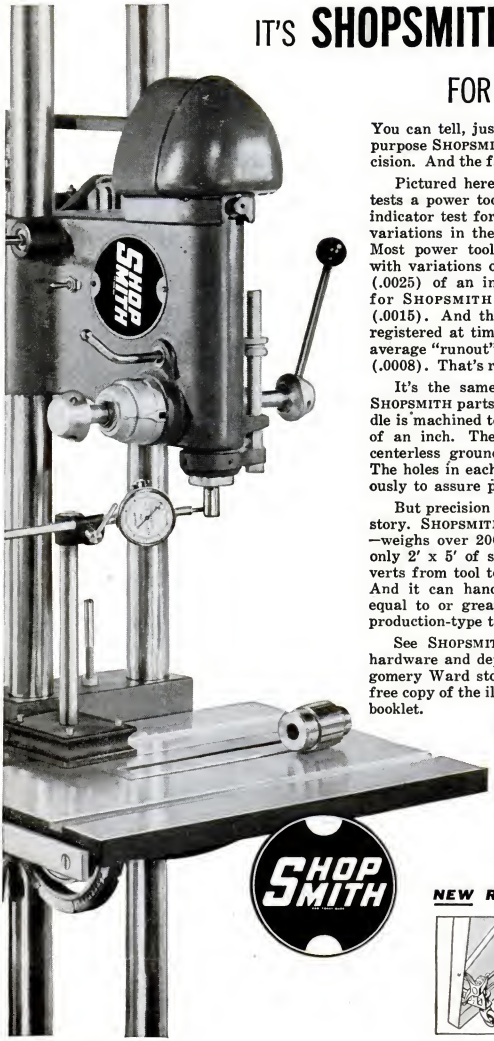


IT'S SHOPSMITH FOR PRECISION

You can tell, just by looking at it, that multi-purpose SHOPSMITH is a tool of exceptional precision. And the facts prove it!

Pictured here is one of the most revealing tests a power tool can be put to. It's the dial indicator test for spindle "runout"—determines variations in the trueness of spindle rotation. Most power tool manufacturers are satisfied with variations of twenty-five ten-thousandths (.0025) of an inch. The allowable maximum for SHOPSMITH is fifteen ten-thousandths (.0015). And the records of all SHOPSMITHS, registered at time of final inspection, show an average "runout" of only eight ten-thousandths (.0008). That's real precision!

It's the same precision you find in other SHOPSMITH parts. The induction hardened spindle is machined to two ten-thousandths (.0002) of an inch. The two tubular steel ways are centerless ground to two thousandths (.002). The holes in each casting are bored simultaneously to assure perfect alignment of all parts.

But precision is only part of the SHOPSMITH story. SHOPSMITH is a rugged, heavy-duty tool —weighs over 200 pounds. It's compact—takes only 2′ x 5′ of shop space. It's flexible—converts from tool to tool in less than 60 seconds. And it can handle big work—has capacities equal to or greater than the most expensive, production-type tools.

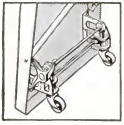
See SHOPSMITH demonstrated—at leading hardware and department stores or any Montgomery Ward store. And send today for your free copy of the illustrated, 16-page SHOPSMITH booklet.

$189.50

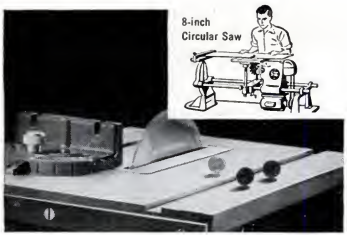
complete 5-tool unit without motor.*

*Special SHOPSMITH motor —heavy-duty, ½ h.p., ball bearing, capacitor, 110 V, 60 cycles — **$34.50.**

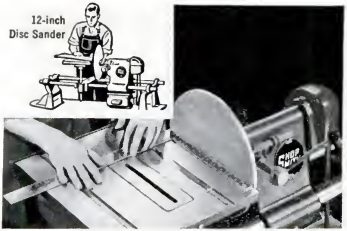
NEW RETRACTABLE CASTERS



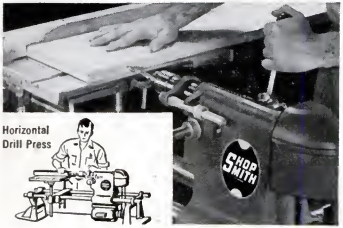
For moving, rolling or locking 225-pound SHOPSMITH. Mount easily on any wood or metal bench. Set by three-stage foot lever. At your SHOPSMITH dealer's. $11.95.



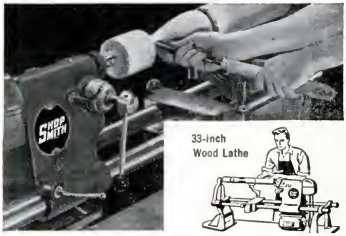
VIBRATION TEST. Nickels stand on edge while SHOPSMITH saw whirls at full speed. Quiet, vibration-free operation is due to precision construction, four ball bearings in arbor, and extreme rigidity of tubular steel ways.



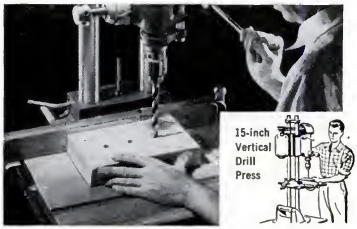
SQUARE FINISH. Carpenter's square demonstrates accuracy of SHOPSMITH as a disc sander. Accuracy is automatic because of extra-large table, micro-graduated miter gauge, exclusive feature which permits disc to be fed into work.



NEW AND PRACTICAL. Horizontal drilling takes the limit off the length of the work you can handle, performs drilling operations that are impossible or which require special jigs on vertical drill. 4-inch quill feed. Adjustable depth gauge. Variable speeds.



RIGID LATHE BED. In less than a minute, SHOPSMITH can be converted to a heavy-duty wood lathe with 15-inch swing, 33 inches between centers. Thick-walled centerless ground steel ways, stress-tested at over a ton, assure minimum vibration.



PERFORMANCE PLUS. For accuracy, capacity, precision features, you can't beat SHOPSMITH as a vertical drill press. Jacobs key chuck takes drills up to ½ inch. Note use of rip fence as handy guide for accurate drilling.

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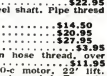

Powerful 48-strand galvanized steel wire cable, 1000-lb. pull. Strong turnbuckle, 12-in. adjustment. Wonderful to guy, strengthen gates, fences, buildings, doors, windmills—secure television antennas—excellent tow cable. Cost Gov't. **$1.10** each. Special—10 for **$3.89**; 50 for **$16.47**; 100 for **$29.32.** Ft. Frt. Paid.

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- **High Pressure Pump.** Stainless steel shaft. Pipe thread Self priming. Positive displacement.
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- **Stone Job Lot,** 12 finest Norton wheels, 1" to 4".....$3.89
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Wind-Velocity Gauge for Home Use

A NEW and comparatively low-cost wind-velocity meter for home use is put on the market by Batson Electronics, Inc., of Omaha, Neb. The rotor is mounted on a pole or rooftop, while the meter case may be placed on a desk or wall as far as 200 feet away. The spinning rotor generates current that, when measured by the meter, indicates wind speed—up to 75 m.p.h. The Galegage is priced at $29.50.

The ONLY kind of screening that can't Rust, Rot or Corrode!

NEEDS NO PAINTING to protect it, because: Neither snow, rain, smoke, fog nor salt air can harm Lumite screening! Cleans easily with a damp cloth.

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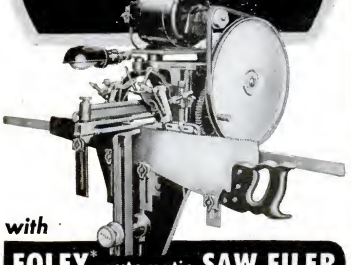

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Make up to $2 or $3 an hour in Spare Time. With the high prices of food, clothing and everything else, just think what you could do with extra money every week! With a Foley Automatic Saw Filer you can file hand, band and circular saws better than the most expert hand filer. "The first saw I sharpened with my Foley Filer came out 100%"—writes Clarence E. Parsons. Every saw you sharpen with the machine accuracy of the Foley Saw Filer is an ad that brings you more customers. Cash business, no canvasing. No eyestrain, no experience needed.

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Shows just how you can start at home in spare time in your basement or garage. Just think—with a small investment, no overhead, no stock of goods to carry, you can get right into a cash business—and later on develop into a full-time repair shop. Send coupon today for this practical plan. No salesman will call.

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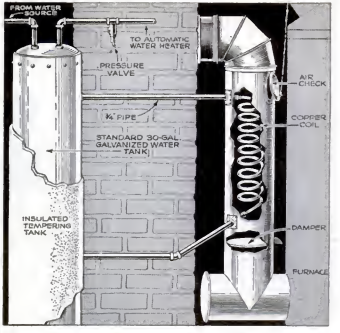
Name.....
Address.....



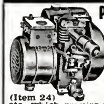
Tank Cuts Water-Heating Cost

My automatic water heater proved costly until I installed the setup shown. It preheats water with heat normally lost up the furnace smoke pipe and stores the heated water in a tempering tank. I placed the coil in the smoke pipe where it would not interfere with the damper or check valve. Then I connected the pipes. To make the joints smoke tight, I cut squares of tin to fit snugly around the inlet and outlet pipes and screwed the squares to the smoke pipe. I filled in any crevices with powdered iron cement.—*Harold J. Pearson, St. Cloud, Minn.*

Nails Hold Parts for Finishing

When drying small objects that have been lacquered or painted, it's always hard to find a convenient place to set them where they won't be marked from contact with the surface on which they rest. Setting the objects on nails upended in cardboard, and then brushing or spraying on the paint, eliminates this problem. The nails leave no trace of contact, and air can circulate all around to facilitate drying.

TERRIFIC VALUES - SURPLUS - SAVINGS UP TO 85%



Portable LIGHT PLANT

PUSH BUTTON START

500-700 watts 110-120 v. — 60 cyc. A.C. Powered by a sturdy dependable, easy starting, air cooled 1¾ hp. gas engine. No wiring necessary, just plug in and operate. Plenty of current for any oil burner, freezer, brooder, pump, emergency lights, etc. which require up to 700 watts. Ideal for Civil Defense, Fire Depts; trailers & camps. Complete with Voltmeter and built-in winding to charge 6 v. auto batteries. Wt. 85 lbs. Fully guaranteed. **Be prepared if war or storm knocks out power lines.** (Item 24)

Reg. $275.00 value............ **$143.50**

700-800 Watt Plant (Item 44) same as Item 24, but larger generator................ **$169.95**

1000-1200 Watt Plant (Item 45) same as Item 24, but larger gen. & eng..................... **$199.50**

HEATING & VENTILATING FAN

(Item 10) Easily installed in furnace pipes. Forces even heat to all rooms. Over range, removes kitchen smoke and odors. Powerful continuous duty motor, 110-120 V. A.C. Quiet, super efficient fan moves huge volume of air (400 to 600 c.f.m.) 8" Fan, wt. 5 lb. **$6.35**; 9" Fan, wt. 6 lbs. **$7.45**; 10" Fan, wt. 7 lb. **$8.45**; 12" Fan, wt. 8 lbs. **$9.45.**

½" DRILL

Removable handle

(Item 33) DeLuxe model —powerful, smooth running, precision built. Handles toughest jobs. Cutler-Hammer switch, **Jacobs** key chuck. 110-120 v. AC-DC 300-450 rpm. Alum. alloy case for high strength and easy handling. Built-in blower assures cool operation. Cap. ½" in steel. 1 year written guar. Wt. 11 lbs. Should be $65. Special.......... **$34.50**

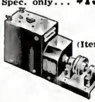
¼" DRILL

(Item 34) Hi-power, long-life, smooth running. Alloy steel gears; built-in blower. Cutler-Hammer switch. **Jacobs** hand-tite chuck. 110-120 v. AC-DC 1000-1600 rpm. Cap. ¼" in steel. 1 year guar. Wt. 4 lbs. Terrific value at **$12.95.**

38 Pc. DRILL KIT

(Item 35) Includes above illus. guar. drill, buffers, polishing bonnet, sanding discs, grinding wheels, wood bits, steel bits, wire wheels, bench stand, paint mixer, burrs. Complete in heavy steel case. Wt. 13 lbs. 38 pc's., all highest quality. Complete kit worth $38.50. Our Spec. only... **$19.85**

HEAVY DUTY ARC WELDER



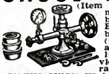
(Item 38) Use as portable or shop welder. 250 amps, D.C., Senior model. Made for years of trouble-free, continuous service. Will handle light or heavy jobs. Weld up to ½" plate using ¼" rods. Built-in air-cooling system. Arc is easy to strike and hold, because of specially designed arc stabilizer. Hi-lo switch and dial control gives wide range of welding heats. Run welder at 2600 rpm. with tractor, jeep or 10 hp. gas engine, or 7 hp. elec. motor. Complete with instructions, guar. and double V belt or flat pulley. Wt. 110 lbs.

A $400 value at................ **$99.75**

WELDING KIT. Two 10 ft. leads, welding helmet, electrode holder, ground clamp, assorted rods.

Sold only with welder at......... **$10.50**

GAUGE TESTER



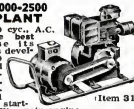
(Item 27) Precision made of solid bronze by Star Brass Co. Calibrated weights (incl.) acting against hydraulic piston, provides quick accurate testing of all pressure gauges up to 3000 lbs. per sq. in. Brand new in hardwood cases. Wt. 100 lbs. Reg. $435.00. Our Spec...... **$135.00**

HYDRAULIC HOSE

High pressure, heavy duty, complete with swivel fittings. Pipe thread connections. Ideal for farm equip., bulldozers, grease guns, airbrakes, etc. Any length. Minimum $1 per lgth. INSIDE DIAMETER, ¼" **50¢** per ft. ⅜" **60¢**, ½" **80¢**, ⅝" **90¢**.

MANUFACTURERS AND JOBBERS — Write us about your surplus items

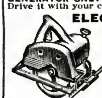
GIANT 2000-2500 WATT PLANT



110-120 V. 60 cyc., A.C. **Absolutely the best made because its** heavy windings develop up to 5000 watt overload for motor starting. Skid-mounted—portable. Powered by 5 h. p. easy starting Briggs or Wisconsin engine —complete with all accessories; engine easily disconnected for other uses. Big outlet box, voltmeter, no wiring necessary. Ample current for all purposes. Factory warranty and instructions included. Wt. 220 lbs. Reg. $585.00. Special at.... **$299.50** (Item 31)

GENERATOR ONLY and control box. Drive it with your engine or tractor **$169.50**

ELECTRIC HAND SAW



(Item 36) Most perfectly balanced and smoothest running saw made. Advanced design provides max. power and light weight. Easily adjusted for all angles, depth and width of cut. Comes complete with 6¼" comb. blade, ripping guide and 10 ft. hvy. duty cord. Built-in sawdust blower. Autom. telescoping guard. 110-120 v. AC-DC. Depth of cut 2⅛". 1 year written guar. Wt. 12 lbs. Drastically reduced.............. **$39.95**

ANGLE DRILL

(Item 23) Fits into chuck of any electric or pneumatic drill or flex. shaft. **Operates at any angle in a full 360° arc.** Makes possible drilling, grinding, carving, routing, etc. in close cramped quarters. Makes impossible jobs easy. Made by Kett Tool Co. Complete with built-in chuck (¼" capacity) and adjusting key. Hardened alloy gears. Precision built for heavy duty. Lists at $39.95—while they last..... **$9.95**

CARRY-AIR

(Item 32) Stainless steel tank—capacity 500 cu. in. at 400 lbs. press. complete with inlet and shutoff valves, press. gauge, detachable air hose, tire chuck. Fill at any service station. Carry air for tire inflation, blowing out lines, spray painting, insecticides, etc. One emergency pays back cost. Wt. 13 lbs. Worth $20.00. Our price.......... **$9.75**

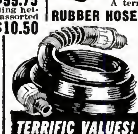
POTTERS WHEEL

(Item 47) Complete, prof. equip. for making finest ceramics and pottery. Large dynamically balanced cast-aluminum reversible turntable with variable speed drive (38 to 140 rpm) controlled by foot-pedal. Built-in adjustable arm rests, water cup and wedging wire. 16x12" enclosed throwing table—ample area for largest pieces. Req. ¼ hp. motor (not incl.). Can be set up on 20x24" table and stored on edge. Complete with pulleys, belts and instructions. Wt. 26 lbs. $145 value at.................. **$59.95**

VARIABLE SPEED DRIVE

(Item 48) Works on variable-pitch pulley principle. Provides instant variable speed range up to 4 to 1. Rugged constr., forced lubrication. Input up to ½ hp. Perfect for lathes, drills, grinders, potters wheels, centrifuges, midget vehicles, etc. Wt. 8 lbs. A terrific value at...... **$9.45**

RUBBER HOSE



New genuine Neoprene Hose — outlasts ordinary rubber 3 to 1. Reinforced with super tough cotton cord plies. Flexible. Easy Flo brass couplings with standard pipe threads for quick connections, included. **Pump water for irrigation, stock tanks, home, barn, fire fighting, etc. Pump Gas or Fuel Oil,** Save more than 60%.

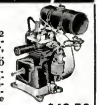
(Inside Diam.)	1¼"	1¼"	1½"
Length	25 ft.	40 ft.	30 ft.
Price	9.25	14.75	14.75

If specified we will send special hose for gas or oil at same prices.

AIR HOSE

(Item 11) ¼" Diam. heavy duty, double braid, suitable for gas stations, spray painting, air tools, etc. 20 ft. with standard swivel couplings. Wt. 4 lbs. Reg. $6.50 val.—only **$2.95.** Five 20 ft. lgths. (100 ft.). Wt. 20 lbs. Only **$13.75.**

GAS ENGINE



(Item 25) Air-cooled. 1½-2 h.p. Complete with gas filter, air cleaner, governor, fuel tank. Ready to run. Speed range 2000-3600 r.p.m. ⅝" shaft. Rope start. Ideal for pumps, air compressors, power tools, generators, etc. Factory warranty and instructions incl. One of the best made. Wt. 40 lbs. Worth $72.50. Special.......... **$46.50**

HOT WATER HEATER

(Item 26) Immersion type, heavy duty, 115v. A.C. 300w. Does not require watching. Thermostat shuts off at 165°. Keeps water hot for shaving, washing dishes, etc. Made by Cities Service. Wt. 4 lbs. Worth $9.50. Our Special........ **$4.50**

PRESSURE SWITCH

(Item 30) Penn Electric Model 110 BPO2, best made. For pumps and air compressors. Heavy duty. Will handle up to 250 lbs. press. and up to 5 h. p. Autom. unloader valve, for easy starting. 110-220 v. A.C. or D.C. 2 pole. Wt. 5 lbs. Reg. list $17.50. Our Spec. **$9.45.**

CLIP BOARD

(Item 17) Heavy Masonite, with self-adjusting spring hinge to hold up to 100 sheets of 8½x11 paper. Push back cover for instant release. Flip cover shut and notes or drawings are protected. Perfect for pilots, engineers, students, artists, truck drivers. Wt. 2½ lbs. Usually $2.95. Spec. **$1.10, 2 for $2.00.**

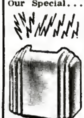
FIRE EXTINGUISHER

(Item 39) Fully charged (at 1,000 lbs. P. S. I. or more) with CO2 (carbon dioxide), the proven miracle fire fighting chemical that smothers oil, gasoline and electrical fires. Play safe; keep one in your car, garage and home. Heavy ICC approved steel cylinder, valve and 3000 lb. gauge that shows available remaining pressure. REFILLABLE at nominal cost. Hose included for emergency tire inflator or air blast. Wt. 4 lbs. $19.50 value. Special.............. **$6.95**

GEM CUTTER

(Item 49) Complete Prof. Lapidary mach. for cutting, shaping, grinding and polishing precious and semi-precious stones. Precision built with big horiz. power driven gem cutter, built-in cutting lubricator; genuine 6" supercharged diamond saw, lap wheel, abras. whls., 2 scratch whls., 4 felt whls., grinding and polishing compounds, brushes, dop cement and sticks, cutting oil, ext. cord, asstd. gems, complete instructions. Requires ¼ hp. motor (not incl.). Wt. 22 lbs. Worth $99.50. Our Special...................... **$39.95**

FIRE or BURGLAR ALARM



(Item 46) Completely automatic. Wind and hang anywhere. Thermostatic element sets off loud clanging bell if heat reaches 140° (setting adjust.). A fool-proof burglar or signal alarm when used with trip cord attached to door, window, invalid's bed, etc. Sturdy metal constr. assures lifetime of protection. Ideal for homes, stores, whse., gar. etc. Wt. 3 lbs. Easily worth $20. Special............ **$4.95**

EXTENSION CORD

(Item 16) 40 ft. heavy duty, made of specially insulated No. 14 2-conductor wire. So tough that you can drive over it and yet amazingly flexible and easy to handle. Resists oil, grease or water. Extends electricity up to 400 ft. without voltage drop. Use indoors or out. Complete with heavy rubber plug and outlet. Wt. 2½ lbs. Usually $4.50—Special 40 ft. **$1.99**
Comb: 2-40 ft. and 1-20 ft. (total 100 ft.) **$4.95**
100 foot length (one piece).......... **$4.85**

WIRE SPECIALS (Item 50) #14—2 cond. same as above, but no fittings, wt. 6 lbs. **$4 per 100 ft.**

TRENCH-LAY WIRE (Item 51) Anaconda #10 —2 cond., for buried service to barns, outdoor lights, etc. Absolutely impervious to soil and moisture. Wt. 25 lbs. per 100 ft. Special surplus price. 100 ft. coils, **19c** per ft.; 250 ft., **18c** per ft: 500 ft., **17c** per ft.

PARTS WASHER

(Item 20) Store gas or carbon tet. in 5 gal. safety can. Valve releases just the right amount into washing compartment. Parts are washed and drained **on a "dunking" screen — no fishing** for parts. Eliminates fire-danger, waste, spillage, evaporation. Wt. 14 lbs. Reg. $19.50—Special.... **$5.95**

All items brand new. Prices f.o.b. Chicago area. 10 day Money back guarantee. Send check or M. O.

MASTER MECHANIC MFG. CO., DEPT. 46, Burlington, Wis.

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Fire-Fighting Jeep Guards Racers

STATIONED in the dead center of a New Jersey stock-car racing track is this specially equipped fire-fighting Jeep, developed by Walter Kidde and Co., of New York City. A bank of six 75-pound-capacity cylinders, carried in the main rack, can discharge 500 pounds of carbon dioxide foam through a Multijet rapid-discharge nozzle to put out any collision blaze. For smaller fires, the Jeep carries four 15-pound portable units in the side brackets.

Baby Can't Upset Cup

THE manufacturer of this cup says that baby will not be able to upset it because of a weighted bottom. A transparent snap-on cover with small drinking holes is also claimed to help keep out dirt and baby's fingers. Westland Die and Engraving Co., of Los Angeles, prices the cup at 89 cents.

Boots Protect Wall from Ladder

WHILE painting the trim on my house, I noticed that the ladder legs resting against the asphalt siding marred the surface. I pulled an old pair of galoshes over the projecting legs of the ladder top, as at left, and that fixed it.—*V. H. Lamoy, Upper Jay, N. Y.*

Race Horses Shod for Speed

WHEN the ponies run at the track, most of them sport lightweight aluminum shoes.

GROBAN'S BRAND NEW WAR SURPLUS SPECIALS! UNCONDITIONALLY GUARANTEED

WE'VE MOVED TO NEW—LARGER—BETTER QUARTERS. NOTE NEW ADDRESS AT BOTTOM

GENERAL MOTORS-ALLISON

CENTRIFUGAL PUMP

200 GALLONS PER MINUTE

(Item #130)

- For Draining Basements
- Fire-Fighting
- Irrigation
- Fuel Transfer
- Swimming Pools
- Home Water Systems
- Dewatering

This General Motors-Allison Centrifugal Pump—designed for use on U. S. Air Force Mustang fighters, now converted for commercial, home, and industrial high volume pumping applications. Inlet, 2½" standard pipe thread, twin outlets with 1½" pipe thread, ball bearing supported ¾" shaft. Easy, fast simple priming. Rotation, counter-clockwise facing shaft. Shipping wt. 35 lbs. Gov't acq. cost 3 45.00. F.O.B. Chicago Now Only **39.50**

Suction Lift	Head Pressure	Gal. Per Min.	H.P.	R.P.M.
10'	75'	260	6.0	3500
10'	65'	200	3.0	2500
10'	80'	40	1.5	2500
10'	50'	140	3.0	3500
10'	30'	100	3.0	2500

NEW! STATIONARY OR PORTABLE

D.C. Arc Welder

250 AMPS. MODEL 252 (ITEM #651)

Now at a fraction of its value

FOR ANY WELDING JOB LIGHT OR HEAVY

STOP COSTLY REPAIR BILLS. WELD IT YOURSELF AND SAVE

Only one or two jobs will pay for entire welder. Designed for many years of trouble-free service. This precision-engineered Direct Current ELECTRIC ARC WELDER is offered at but a fraction of its original value. It can be mounted permanently or easily transported for portable use. Does the job instantly where and when you need it. Has dial type rheostat for easy pinpoint control and a high-low range switch. Run welder at 2500 RPM from drive pulley or power take-off of tractor, a 7½ HP electric motor or a 10 HP gas engine. Use two V belts or flat belt (on pulley). Price includes double V or flat belt pulley and instruction book. Shpg. wt. 107 lbs. F.O.B. Chicago **99.50**

BYRON-JACKSON "PUP"

CENTRIFUGAL PUMP UNIT

$3800.00 VALUE

Complete With Full Engine And Pump Instructions

2 Stage Model "PUP" Pump Driven by an 8 Cylinder Model C-36 Chrysler Industrial Engine.

IDEAL FOR: Pick-up, Gathering, Fire Fighting, Salt Water Disposal, Sprinkling, Irrigation, Dewatering, Construction, etc.

Engine Speed 2400 RPM—100 HP. 600 GPM at 175 PSI—Parallel Connection. 300 GPM at 375 PSI—Series Connection

These skid-mounted Pumping Units are standard production models with parts and service readily available. Designed for a wide range of operating conditions particularly where wide variation in head and capacity are required. Twin suction and discharge ports are cast on the same side and so arranged that external piping is interchangeable for either parallel or series pumping applications. Overall dimensions, 114" L x 29" W x 62" H. Weight, 1760 lbs. Now, complete with full priming equipment, operating instructions and performance data. ONLY..... **1495.00** F.O.B. Chicago

(Item #132) ACCESSORIES INCLUDED

Hydraulic Cylinders-Air or Oil

Large supply of new labor-saving, economical hydraulic equipment in many types and sizes. Use these positive, highly efficient, smooth pressure hydraulic presses, jacks, lifts, loaders, power control, positioning, brakes, plastic dies, auto frame alignment, etc., etc.

ITEM #70—Purolator hydraulic oil filter. Permanent element type. ¾" female pipe thread ports. Capacity, 16 gallons per minute. A $13.00 value. Now **Postpaid** **4.95**

ITEM #4—A 1½" bore, double action hydraulic cylinder, 1½" bore, 27½" stroke. Clevis mounting. Will lift 1000 lbs. with 1000 P.S.I. line pressure. Perfect for positioning and feeding movements. Shpg. wt. 4 lbs. **Postpaid** **4.95**

ITEM #33c—Double action hydraulic cylinder, 1½" bore, 4½" stroke. Clevis mountings at both ends. Uses ¼" pipe fittings. **Postpaid** **8.95**

ITEM #32—Double action, 1½" bore, 9" stroke, will lift 1760 lbs. with 1000 P.S.I. line pressure. Wt. 4 lbs. A $45.00 value. **Postpaid** **10.95**

ITEM #16C—Double acting hydraulic cylinder, 1½" bore, 26" stroke. Will lift 1760 lbs. with 1000 PSI line pressure. Weight 8 lbs. A $75.00 value. Now only. **Postpaid** **16.95**

ITEM #103—Double acting hydraulic cylinder, 2½" bore, 17" stroke. Clevis mounting. Will lift 4900 lbs. with 1000 PSI line pressure. 1½" diam shaft. ¾" tubing thread ports. Overall length closed 29½". Shpg. wt. 11 lbs. F.O.B. Chicago **21.50**

(Item #42)

ITEM #34c—Double action hydraulic cylinder, 3½" bore, 11" stroke. Aluminum alloy cylinder wall and all steel 1¼" piston rod. Clevis mounting at base and shaft. 19½" overall length closed. Will lift 9625 lbs. using 1000 PSI from Loran Heavy Duty Hydraulic Pump. Uses ¾" tubing for fittings. Value $102.00. Shpg. wt. 11 lbs. F.O.B. Chicago **22.50**

ITEM #6—Double action hydraulic cylinder, 3" bore, 24" stroke, will lift 7070 lbs. with 1000 PSI line pressure. Steel barrel. 1¼" stainless steel shaft. Gov't acq. cost $176.00. Shpg. wt. 26 lbs. F.O.B. Chicago **28.00**

ITEM #42—Double action hydraulic cylinder, 4" bore, 18" stroke. Rated lift capacity with 1000 PSI line pressure is 12,500 lbs. Ship. wt. 30 lbs. F.O.B. Chicago. An excellent Buy for **32.50**

LOGAN HEAVY DUTY

HYDRAULIC PUMP

For operating hydraulic cylinders and hydraulic motors on tractors, bulldozers, construction machinery, lift jacks, presses, etc. Delivers 10 GPM at 1200 RPM at 1000 P.S.I. using 6 HP. Has a ¾" inlet, ½" outlet, ¾" shaft with flat and keyway for direct or pulley drive. Has flange with 4 bolt holes for convenient mounting. Ship. wt. 22 lbs. Overall dimen. 7" L x 4½" H x 5½" W. A $105.00 value FOR ONLY ..... **22.50** F.O.B. Chicago

(Item #291)

(Item #129)

FLUID HAND PUMP

fuel transfer pump, etc. Shipping wt. 7 lbs. F.O.B. Chicago **11.95**

general utility hand pump. May be used as a sump pump, barrel pump. Type D4—Bronze and aluminum construction. ¾" pipe thread inlet and outlet. Fine

DIRECT CURRENT GENERATORS

For welders, plating, truck and marine use, D.C. appliances, lights, etc. Aircraft quality—lifetime grease sealed ball bearings. Heavy duty.

Item #131—Brand new Electric Auto-Lite 12 volt Direct Current electric generator, rated 18 amps. Complete with blower and pulley. Use for trucks, tractors, boats, battery chargers, etc. Part No. GEF-4805A. In original sealed U. S. Army cartons. $40.00 value. Shpg. wt. 27 lbs. F.O.B. Chicago. Now Only.. **15.00**

Item #90—Type P-1, rated 200 Amps.—28 Volts, 2300 RPM. Mfd. by General Electric. Ford, Delco-Remy and Westinghouse. Gov't Acq. Cost $300.00. Shpg. wt. 70 lbs. F.O.B. Chicago **22.50**

Item #91—Type R-1, rated 300 Amps.—30 Volts. Mfd. by Jack & Heinz. Gov't Acq. Cost $380.00. Shpg. wt. 70 lbs. F.O.B. Chicago—Each individually packed in wooden box **35.00**

(Item #115)

HYDRAULIC SPEED REDUCER with FINGERTIP CONTROL

USE FOR: • Reamer Drives • Midgard Cars • Feeds • Canning Machines • Conveyors • Lathes • Milling Machines • Motor Boats • Cream Separators • Garden Tractors • Pumps

Variable output speeds ranging from 0 to input speed now available. Merely move control handle until desired speed is attained. Then turn locking handle to maintain the setting. Internal relief valves prevent overloading. Use input power of ¼ to 1½ H.P.

This Westinghouse-Oil Gear Unit converted to commercial use from 40 MM anti-aircraft traversing mechanisms consists of a variable displacement hydraulic pump feeding a fixed displacement hydraulic motor. These components are contained in a crackle-finished steel oil reservoir (capacity 2 qts.). Adjustable relief valves set at factory for 100 inch pounds of torque. Use between 150 inch pounds and 150 inch pounds reverse control allows full output power and speed selection in either direction of rotation. Both input and output shafts measure ⅝" diam., include keyway. Input rotation is counter-clockwise facing shaft. Recommended input speeds not to exceed 750 R.P.M. Overall dimensions 7½"x7½"x11½". Gov't. acquisition cost, $428.00. Shipping weight 26 lbs. Complete with 2 qts. of oil and full instructions. F.O.B. Chicago **54.50**

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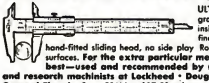
Listing Brand New War Surplus bargains including Aircraft quality hydraulics, A.C. generators, pumps, welders, tanks, and many, many others. You save on everything! Write today!

WAR SURPLUS AND OTHER BARGAINS

"BALTIC" SWEDISH TOOLMAKERS VERNIER CALIPER



ULTRA PRECISION—0-6" in .001 graduations. Quick, accurate depth, inside and outside measurements, fine engraving. Extra heavy rule, hand-fitted sliding head, no side play Rockwell C-60, lapped measuring surfaces. **For the extra particular mechanic who must have the best—used and recommended by most critical experimental and research machinists at Lockheed • Douglas • Bendix • GM • RCA • General Electric.** Save 50%! A $37.50 value—only **$17.25**—Leather case incl. Also a standard grade Mauser Design Caliper • made in Germany • For the production machinist, 0-6" in thousandths, the most accurate caliper of this type on the market, thousands of satisfied users—only **$12.95**—Leather case included.
These are both guaranteed buys. Your money back if not entirely satisfied. Order now!

RIVET SETS Universal type, case hardened tips. Set of dies will head up any brazier or round head rivet from 1/16" to 1/8". With adapters for air gun or hand use. All new...cost Government about $27.00. Complete 15 piece set, wt., 2 lbs., **$5.00**

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Chrome plated, precision engineered and carefully tooled to give long life. All new.
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High Speed Steel, like new. Ass'd sizes from No. 1/4 to 40. Lengths from 6" to 12" Approximately $20 value. Set of 12 ..... **$3.75**

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Sharpens round, square or tapered drills up to 6" long. Even an amateur mechanic can get a new, factory finish on a drill in 25 seconds. New protractor feature gives every drill sharpening angle with 5 convenient angles already marked off. Usable with hand or power stone. A brand new development, manufactured by Ten Eyck. Shipped postpaid

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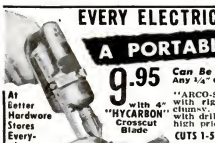

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How to Make a Plastic Clock Crystal

If the rectangular crystal on your alarm clock is broken, you can make another of unbreakable plastic.

First you need two wooden dies. Measure the outside dimension of the old crystal and cut a hole 1/16" larger, but of the same shape, in a piece of scrap wood. Trim down the cut-out waste block ¼" all around, and nail it to a larger piece of wood. Use 1/16" Plexiglas or Lucite for the crystal. Immerse the plastic in boiling water for a few minutes until it becomes soft and pliable. Place it over the hole in the die while still hot and smoothly and quickly press down on it with the small die block. Remove the excess plastic around the edges so that the crystal fits properly over the clock face.—*William E. Danneman, Chicago.*

Clamping Block Loops Up Lamp Cords

To shorten overhead lamp cords, make this little clamp from scrap wood, plastic, or hard rubber. Cut a block ¾" by 1½" by ½" and round off the corners. Bore two ¼" holes in the block, with centers ⅞" apart, for the lamp cord to pass through. Bore a centered 3/16" hole through the side of the block to take a round-head machine screw 1" long. With a hacksaw, slice the block in two, edgewise.

To shorten a cord, insert it in the block, as shown, and clamp tight with the screw, two lock washers, and a wing nut.

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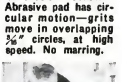

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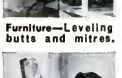

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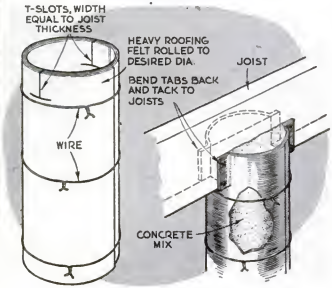
Roofing Felt Makes Concrete Form

An inexpensive and quickly built form for pouring concrete underpinnings can be made from ordinary roofing felt, as shown in the drawings. Other cylindrical forms, such as fence posts and columns, can also be poured this way.—*Ralph L. Kyker, Fresno, Calif.*



Radioactive Thread Treats Cancer

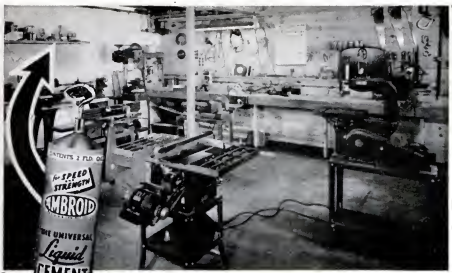
A new tool in the treatment of cancer is a radioactive thread that a surgeon stitches into place. Made by inserting a radioactive cobalt wire into an extremely narrow nylon tubing, the thread is said to be flexible enough to limit irritation of the tissue. After a treatment is completed, the thread is removed like a conventional suture. Dr. William J. Myers, of Ohio State University Medical Center, developed the method.

New Mold Drug Used to Fight TB

A close relative of streptomycin, and effective against tuberculosis germs that resist streptomycin, viomycin is still another addition to the powerful disease-killers derived from molds. When used in treating tubercular guinea pigs at the Mayo Foundation, researchers found that the new drug caused a definite slowing up and healing of the disease.

Birds Get Migration Tip-Off

How birds know exactly when to start their long migratory flights is still an unsolved problem. Certain physiological changes, involving the disposition of fat in the body, however, are believed to be one important factor in tipping off the birds that it is time to migrate.



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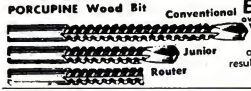

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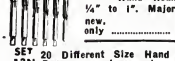

Heavy duty; brand new. Adaptable to 1/4" and 1/2" electric drills, bench and air grinders, etc. Consists of:

FOUR—8" x 1/4" x 5/8" arbor aluminum oxide resinoid 1.20A75 grinding wheels.
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FOUR—2 1/4" x 1/2" x 1/2" arbor 60-grit wheels.
TWO— 8" x 1/2" x 1/2" arbor cut-off wheels.
ONE— 6" x 1/4" x 1/2" arbor resinoid bond wheel.
TWO— 4" x 1/2" x 1/2" arbor 130-grit Norton wheels.
PLUS— 1/2" arbor with 1/2" mandrel to fit 1/2" wheels.

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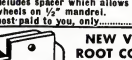

Pump has 1" connections, built-in relief valve, adjustable up to 1500 lbs. Max. Capacity 6 GPM.

1 1/2 H.P., 24-volt motor. 4000 RPM. Can be used on 12 or 36 volts. 500 units available at quantity discounts. Both pump and motor only..... F.O.B. TULSA $12.95

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Here is a kit which by means of arbor furnished gives you fifty 1/4" arbor mounted stones. All stones first quality material. Cost new over $35. Your cost Post Paid..... $9.98

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SAVES SO MUCH COSTS SO LITTLE!

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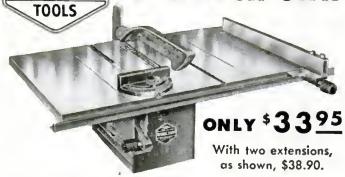

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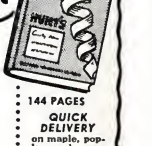

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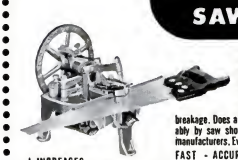

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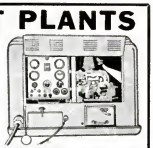

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BRAND NEW. 1½ HP with 6 to 1 reduction gear. Operates at 450 R.P.M. For lawn mowers, scooters, garden tractors, pumps, compressors, generators, etc. List Price $79.50. Shipping weight 54 lbs. SPECIAL PRICE... **$47.50**

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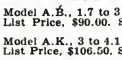

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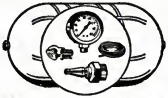

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with belt and variable speed pulleys.....$2.50 extra
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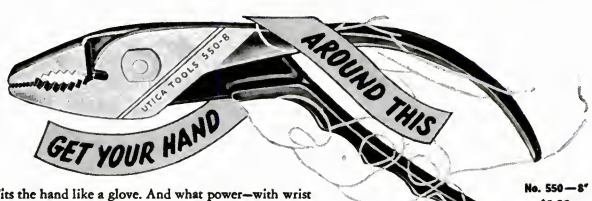

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TILT/ARBOR SAW

• 27x28 in. table stays level. Blade tilts full 45 degrees. • 10 in. blade cuts 3¼ in. deep. Jack-screw depth adjustment. • Floor model. 34 in. table height. • New Departure ball bearing arbor, ¾ in. precision shaft, ready to run, ⅝ in. bore blades. • Quick positioning, self-aligning rip fence guide. • Sturdy wood, steel and aluminum construction. • No machining—build easily with hand tools only. • Capacity and performance of floor saws selling for $150.00 and up!

GIL-BILT Metal Parts Kit, includes Plans, ball-bearing arbor, cast aluminum miter gauge and bar, rip fence guide, machined lock knobs, jackscrew mechanism with 4½ in. handwheel, and all other metal parts including every screw, bolt, nut and washer (less blade) $20.95

Same Kit with 10" combination blade 24.90
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GIL-BILT Step-by-Step pictorial plans (No blue-print reading required), full scale patterns, actual photographs for above 10" TILT-ARBOR SAW, 12" BAND SAW, BELT SANDER, 8" TILT/TABLE SAW $1.00 each, postpaid anywhere in the world. ALL 4 Plans for $3.00, or write for FREE descriptive catalog.

COMPLETE PLANS *only* $1.00 EACH

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Joins All Metals Permanently

EQUAL TO WELDING FOR MOST PURPOSES

Do your own repairing. Kit includes one tube silver solder flux and 10 5-in. lengths silver solder alloy. Hottest ALCOHOL TORCH known. 2700° F. flame. Operates in any position, indoors or out. Torch alone $5. Kit alone $1.50. Complete instructions included with torch and kit. Add 25c on each order to apply towards shipping charges.

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PALMGREN "HOBB-E" Rotary, Index, Milling Table

Ideal for Model Parts or Shop Work

Mill-Grind-Drill-Index-Route curved or straight-Rabbet and Mortise on drill press or lathe. 8" Table, 4" Cross Feed, 360° Rotation. Accurately Graduated, Bolts to table. Order NOW! SAVE $100. Only $54.50. Less Rotary Feed $42.75. Write for "HOBB-E" Tool Circular.

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Table model, gums and sharpens rip saws, combination saws & cut-off saws. Ideal for "Skilsaw" blades. Cap. 4" to 20" diam. Complete with ¼ h.p. motor & 1 grinding wheel & cord—$61 f.o.b. Portland. Shipping weight, 63#. SEND FOR FREE LITERATURE.

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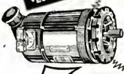
Save $250 to $500



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Instructions included. Rated 200 Amps 28 Volts 2500 R.P.M. Ship wt approx. 50 lbs. Stock No. 707

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Stock No. 711 D.C. Generator R-1 Jack & **Heints, rated 300 Amp.** 30 Volts. Gov't cost $300.00. Instruction for converting to welder or light plant incl Only.......... **$25.50**

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For use with 24 or 32 Volt D. C. Generators. Also recommended for the P-1 and R-1 type generators in "build your own" Light plant. Complete with mounting base. Only **$6.50**

D. C. GENERATOR. Brand new. For Farm—Home—Ranch. Delivers 430 Volts D.C. at 3450 R.P.M. Ball bearing supported. Fan cooled armature. Self lubricating bearing. #211220-A, Wt. 21-lbs Now only.......... **$7.50**

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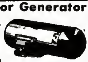

#5AN31NJ18A—Use as 24 32 Volt D.C. motor, pulls ½ H.P. or 0/60 V. D.C. Can be adapted to 110 V. A.C./D.C. ½ H.P. by simple changes in connections. This unit can be adapted to independent and rural lighting, power, etc. Instructions incl. **(Stock #790).** Gov't cost $140.00. Wt. 30 lbs. Only **$7.50**

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Brand New. This is a 24 V. D.C. motor. Has 1- horizontal and 1- vertical take off shaft. Overall gear ratio to motor is 40-1, can be adapted for 2-1 or 20-1 ratio. Ideal as OVERHEAD GARAGE DOOR OPERATOR, DRIVE FOR SMALL HOIST, WELL PUMP JACK, LAWN MOWER DRIVE, DRIVE FOR POST DRILL, etc. Wt. 23 lbs. Gov't cost, $221.00. (Instructions incl.) Only **$9.95**

TWO WAY RIGHT ANGLE GEAR UNIT with universal mountings, 1 to 1 ratio, 90 degree angle gear drive with two ⅜" shafts extending 9/16" from body and three 3/16" mounting holes. Rated ⅓ H.P. at 1800 R.P.M. overall size 2⅛" x 3¾" x 1½" Stock #R-300 Data incl. **$3.50** postpaid

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10-1 or 5-1 ratio, 90 degree angle. Shaft driven ½" spline Shaft with 3 mounting holes 5/16". Gears held in forged and machined aluminum housing with two needle bearings, one bronze bearing, and three high speed shielded bearings. Sealed self lubricating chamber. Price.. **$5.50** (Plus 35c postage)

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Two or more connected together, work perfectly on 110 V. A.C. For weather vanes, rotating directional antennas or controlling distance operations. Complete with diagram and instructions. Wt. 3½ lbs. PER PAIR .... **$6.50** Postage Paid

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Aircraft type. Filters oil without cartridge replacements. Just turn handle and cartridge is clean. Standard ⅜" inlet and outlet ports to accommodate 12 gallons per minute. STOP CHANGING OIL. Instructions incl. .... **$4.95** Post-paid

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ELECTRIC MOTOR ¼ H.P. 28 Volt D.C. R.P.M. 4000 #2812 with simple instructions to convert to 28-32 Volt A.C. Gov't cost $82.84. Brand New.......... **$4.50**

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AIR FILTER HEAVY DUTY AIRCRAFT TYPE. Removes dust, lint, pollen, etc. For industry, Home, Office and Laboratories. For Forced warm air & air conditioning units. Made of heavy metallic Mesh. With metal frame. Permanent type, needs no refills. Size 41" by 6⅝" by 2'. Wt. approx 8 lbs. $15 value. Only.......... **$3.50**

Brand New Wonderful ROTATOR MOTOR

For rotating Ham, TV, FM Antennas, Turntables, Telescopes, etc. Applicable for 110 V. A.C. 60 cycles or for 24 V. D.C. as reversible motor. Approx. 7 R.P.M. Free Swing, Reversible Light Weight. Rugged, quiet. Motor & Gears oil sealed. Including 3 mountings on motor. Simple instructions & diagram incl. Wt. approx. 4½ lbs. **Stock No. S72.** $50.00 Value Now Only **$7.50** Post-paid

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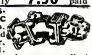
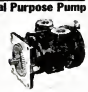


VICKERS CONSTANT DISPLACEMENT HYDRAULIC PUMP. Stock No. PF713-25. Brand New. Powerful, compact, rated 1000 P.S.I. .507 cu. in per rev. 3750 R.P.M. 400 G.P.H. or use as motor.. **$14.50** Post-paid

ROMEC FUEL PUMP

Or use as hydraulic pump or for Vacuum drawing. Rated 150 Gallon per hour at 1750 R.P.M. Has cushioned self lubricating 12 splined shaft. Ports are ½" std. Pipe thread. Here's non-pulsating dependable performance data incl. **Stock No. RD-4550**.......... **$7.50** post paid

Pesco Vacuum Air—General Purpose Pump



Here is a pump for air, fluid, pressure or vacuum. Standard ½" pipe thread. Delivers 300 G.P.H. at 2000 R.P.M. Runs forward or reverse. Self aligning shaft. Spline terminal for direct drive, readily replaced with a pulley. Use them for oil burners, MILKING MACHINES, COMPRESSORS, VACUUM PUMP, etc. Engineering report and instructions incl. Now only.......... **$9.95** Postage Paid

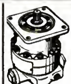
Adel Self-Priming ELECTRIC PUMP

For pumping light oils, oil burners, fluid metering, fuel pump, tool post grinder, coolant, pressure lubricating pump, etc. Double ball bearing series wound motor, continuous duty, 1/30 H.P. rated 12000 R.P.M. Applicable for 24 V. D.C./A.C. or use on 110 Volt A.C. Size 6¾"x3½"x3¼", rated 3 G.P.H. Remove pump and use motor as high speed grinder, etc. Diagram and Instructions incl. $50.00 value. Only.......... **$9.95** Post-paid

THOMPSON MOTOR DRIVEN BOOSTER PUMP

Including Built in Motor. Applicable for 24 V. D.C./A.C. or 110 V. A.C. The motor is explosion proof constructed, making it ideal for pumping GASOLINE, FUEL TRANSFER, HOT WATER HEATING CIRCULATOR. USE IT AS COOLANT PUMP, FUEL BOOSTER, OIL PUMP, etc. Discharge connection is for 1" hose. Rated Capacity 300 G.P.H. Directions & Engineering data incl. A tremendous bargain **Stock No. 1200**—Only.......... **$9.95**

Stratopower Constant Displacement HEAVY DUTY PUMP



For operating Hydraulic cylinders, hydraulic motors on tractors, Bulldozers, Construction machinery. Lift trucks. For fuel or oil transfer. Industrial applications, etc. Delivers up to 400 G.P.H. at 3750 R.P.M. Rated 1250 to 1400 P.S.I. 3750 to 4500 R.P.M. HAS BUILT IN RELIEF AT HEAD. Rotation either direction without adjustment. Can be used as hydraulic motor. $85.00 value. Engineering data & instructions incl. **Stock #37.** Wt. 8 lbs... **$17.50**

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Stock No. 27 Cylinder, Air operated. Bore 2½", Shaft 2¼", Stroke 6", one way Stroke. Can be used as snubber or Brake. Length 15". Wt. 11 lbs. Now .... **$7.50** f.o.b. K.C., Mo.

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Stock No. 12 Hydraulic Cylinder Double Action output 12560 lbs. with 1000 P.S.I. input. Gives 17584 lbs. with our STRATOPOWER PUMP 1400 P.S.I. or will produce 34160 lbs. with 3000 line pressure. Can also be operated on low pressure system. 4" Bore, 8¾" Stroke, 1-5/16" shaft, clevis mounting O. Gov't. cost $300.00 .... **$22.50**

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Brand New. Guarantees equal flow and equal pressure for Two cylinders or Two systems. Capacity 360 G.P.H. 1500 P.S.I. Data & instructions incl. A $75.00 value. **Stock 1-D-397** **$14.50** Post-paid

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Four way control for use with two hydraulic double action cylinders. Each cylinder may be operated independently of the other or in conjunction with the other. Oil may be locked in any of the cylinders to hold the piston at any required position. Brand New. $60.00 value. Only .... **$8.95** Post-paid

Pesco Pressure and Relief Control Valve

Brand new. Designed with 3 ports and external pressure adjustment. Relief valve is spring loaded, and adjustable for controlling pressure regulation. Has two ports for normal flow, one for relief line to fluid supply or to pump inlet. Engineering data incl. A terrific bargain! Only .... **$4.95** Post-paid

No. 575

Hydraulic Solenoid Control Valve

BENDIX. No. 81560 24V. D.C. For remote control operation and to operate one single action or double action hydraulic cylinders with 24 V. D.C. Recommended pressure 800 to 1500 P.S.I. connections are .550"—18thd. Diagrams & Data Incl. $35.00 value—**$3.50** ea. **$6.50** per pair.

ADEL PRECISION #2799 Large Volume hydraulic control and pressure relief valve, ¾" ports, spring loaded. Range 1250 P.S.I. adjustable up to 3000 P.S.I. Brand New.......... **$5.50**

Adel HEAVY DUTY VALVE #D-8660

Here's your four way hydraulic control valve for use with 2 double action cylinders. Each cylinder may be operated independently of the other or in conjunction with the other. ⅜" pipe thread connections with mounting brackets attached to body of valve. A $60.00 value. Brand new **$8.95** Post-paid

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VICKERS UNLOADING VALVE Brand New—Bypasses full amount output of the pump while the cylinder is not in operation. Takes starting load off of electric motor driving the pump. ½" AC TUBE PORTS (¾"-18) thread. Price.... **$8.50** Post-paid

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Do it yourself. Clean and easy to apply. Roll covers about 10 feet of 1/2" pipe, $1.69. *Higher west of Rockies and Canada.* Get at Hardware, Department Stores, or sent postpaid. Write for free circular. J. W. Mortell Co., 534 Burch St., Kankakee, Illinois.

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SELF CONTAINED — NO COMPRESSED AIR

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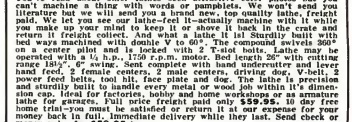

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Colors – per run, yd.

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Dural with welded seams, 2" filler with cap, two standard pipe ports for hook-up. Visible liquid level gauge on side. For gas, oil, water or "spare" on auto, tractor, truck or boat. Sturdy, light. Capacity – 6 gal. . . . 4.95

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A $125 Value . . . . . Add 20% Fed. Tax

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BARGAINS in SLEEPING BAGS

100% KAPOK FILLED BAG – a real treasure for hiker or camper. Special heavy duty, water repellent outer cover – filled with 3 lbs. imported Kapok . . . Has 100" zipper down side and across bottom. Large head flap makes dust cover to keep bug dry and clean when rolled up. Large air mattress pocket. Zip to another bag for double-up sleeping. Ht. 7 lbs. Size 34" × 78" 16.95

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Has outer cover of forest green, water repellent Nylon cloth. Filled with 15% duck down and 85% chicken feathers. 3/4 length zipper. Size 34" × 77" . . . 15.95

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Reconditioned and ready . . . with carrying case. Safe, Lightweight, Easy to Pack and Carry. An Ideal boat for fishing or fun.

1 MAN with PADDLES 14.95 4 & 5 MAN 29.95 7 MAN 42.50
Oars 2.95 PR. Pump 2.95 EA.

SWIM FLIPPERS

Top quality rubber, this pliable tread bottom. Adj. heel strap . . . Reinforced for strength. Vented for air & drainage. Ideal for diving and swimming.

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Soft rubber mask lits over eyes. Heavy duty glass shield. Adj. headband.

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Corrosion resistant. Ideal for spear fishing. 11" long with barbed end. Dia. of socket 1" 3 for $1.19 . . . 49c ea.

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Makes surf and deep sea fishing a pleasure! Ideal for ranchers, oil fields, array use where it is necessary to protect body or clothes from moisture, silt, muck, etc . . . Made of rubberized canvas. Has vulcanized seams & built-in rubber gloves and boots.

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STRONG – LIGHTWEIGHT – NYLON FISHING LINE – ROT-PROOF and WATERPROOF . . . Especially treated for strength and long life. ON SPOOLS.

1500 ft.	10 lbs.	$1.59
1000 ft.	25 lbs.	$1.80
750 ft.	45 lbs.	$3.29
750 ft.	50 lbs.	$3.50
300 ft.	72 lbs. Braided	$3.79

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NAVY Sealed Beam LAMP

U. S. Navy, Portable type. Has Pistol Grip and aiming sight. Makes an ideal search, spot or emergency light for your auto, boat, farm, etc.

12V. light – 4" lens . . . 3.29
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Set of 3 filters – red, green, amber. (specify type lamp) 99c

NAVIGATORS LAMP

A handy light for desk, work bench . . . chart table . . . engine room, etc. Can be used on 6-12-24-110 Volt by changing bulbs. 3 ft. shaft has 4 joints to adjust position 3.29

CLAMP-ON LAMP

Has adjustable ball & socket universal head, long rubber covered cord and wall plug. All-purpose – indoor photography, floodlight, baby or large spot, personal bed reading, work bench, garage, etc. Lamp alone 1.29
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This is a genuine piece of AAF equipment . . . Made of best grade leather in a handsome pebble finish with a light canvas liner. Has two full length map or paper compartments and three smaller pockets. An ideal case for students, salesmen, artists, etc. Full heavy duty zipper closure. 12" × 16" . . . ONLY 2.95

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Aviators (AN-6530) Windproof & Dustproof

Rubber or chamois covered frame. Clear or Green GROUND LENSES are inter-changeable. Adjustable nose bar. Ideal for flying, motor cycling, etc. 2.19

GO-1 GOGGLE KIT NEW! U.S. Navy – Has soft sponge rubber frame. A Pyland lenses 2 green, 1 red, 1 clear. Perfect for racing, cycling, etc. 89¢

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A precision, officers' type compass of unusual accuracy. Has prismatic hair line guide for sighting a distant object and at some time reading number of degrees. Luminous dial for night. Jewel mounted needle. Canvas carrying case for belt 2.95

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Why bother cooking on that trip? This lightweight plastic Thermal Food Container holds enough hot, fresh food for 8 people. Has 2-5 qt. removable Pyrex Baking Dishes for meat, veg. or liquids.

1-9qt. Plastic container for ice, etc. Each section individual – Case of Sturdy Plastic with carrying handle.

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Do armature work faster than on a lathe!

get these **Snap-on*** ARMATURE RECONDITIONING TOOLS

With metal shortages, and higher electrical replacement costs, you're bound to get *lots* of this money-making work from now on! Get set to do it to perfection—faster, easier—than on a costly lathe! With this accurate, sturdy, solidly-built, time-proved tool in your bench vise you control cuts to a thousandth—shave armatures smooth as glass! Takes armatures with shafts 5/16" up to 1 1/16" diameter—adjusts in a moment. Fully warranted by Snap-on—foremost supplier of *professional* tools to automotive mechanics and others for over 30 years. One of 4,000 Snap-on Tools. Not sold in stores. Write for FREE catalog.

SNAP-ON TOOLS CORPORATION
8060-E 28th Avenue
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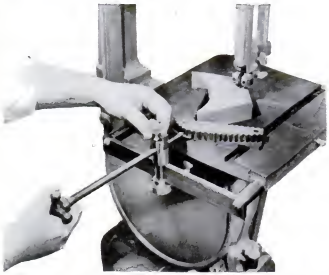
*Snap-on is the trademark of Snap-on Tools Corporation.

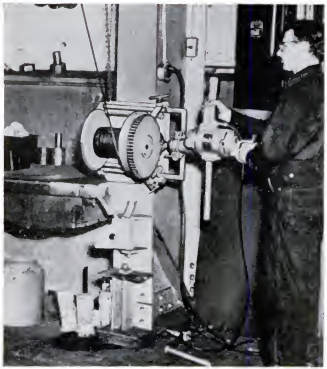
New

Rotary Attachment for Lathes. This attachment handles work in the horizontal plane at any angle to the lathe spindle. Accuracy of one tenth of 1° is guaranteed by the maker, Allan Mfg. Co., of Long Island City, N. Y. Among the jobs you can do with it are: drill, ream, and bore accurately spaced hole patterns; circular and radial milling; milling of cams; flycutter facing; and layout, jig, and fixture work. Used with a surface grinder, you can form many-sided punches and tools. Price is about $80. It fits all 9" South Bend lathes and models are available for other lathes.

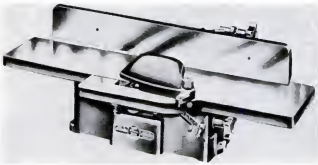


Bandsaw Accessory. Used for precise cutting of metal in irregular curves and shapes, this bandsaw accessory has screw feed, a notched jaw to hold irregularly shaped work, and an adjustable pivot on which work can be swung. The Power Tool Division, Rockwell Mfg. Co., Milwaukee, makes the attachment for its 14" bandsaw.

Tools



Electric Drill Powers Hoist. These two tools—a 1″ drill and a winch—can be combined to give you a power hoist. The drill can be quickly disconnected for heavy-duty boring. Lifting capacity is 1,000 lb. at 10′ per minute. For lowering loads, a hand lever applies a band brake. The drill is made by Skilsaw, Inc., Chicago, and the winch by American Hoist and Derrick Co., St. Paul, Minn.



New 4″ Jointer-Planer. One of the advantages of this machine is that the entire head can be removed and the blades sharpened without disturbing their setting. Specifications include a 25″ table, 3″ by 21″ fence, and a cut 5/16″ deep and 4″ wide. The Atlas Press Company, of Kalamazoo, Mich., is the manufacturer.

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Non-Staining Aluminum Screening

When you get aluminum screening—you'll never have to clean rust and stains off light-colored siding or window sills. Because this new aluminum screening—made of the same tough alloy that goes into America's jet fighters—is protected from corrosion by an outer cladding of special, corrosion-resistant Alcoa Aluminum Alloy.

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- snow-white blade with bold, legible, jet-black numerals and graduations. Graduated in 32nds for first 6 inches.
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- blade ¼" wide made of finest high carbon steel—tempered—Bonderized—enamelled—baked.
- blade replaceable in seconds—without tools—without even opening case. And Evans replacement blades cost far less.
- every "Evans White-Tape" is unconditionally guaranteed.
- exclusive Evans automatic brake gives smoother push-pull action with absolutely no "creeping" of tape into case.
- underside is white, too. Mark with ordinary pencil, remove mark with flick of thumb.
- unheard-of low price*: 10-ft. $1.49; 8-ft. $1.19; 6-ft. 98¢. Prices higher in far west and Canada.

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De Luxe Electric Work Saver Kit

Includes above ZEPHYR Drill, plus 28 accessories for buffing, cleaning, drilling, grinding, mixing paint, polishing, sanding, sharpening, waxing, and wire brushing.

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Adjustable Vertical Drill Stand— for drill press operations

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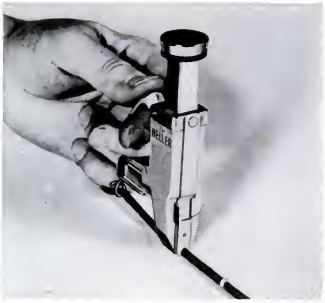
In Canada: Portable Electric Tools, Ltd., 369 Danforth Rd., Toronto 13, Ont.

New Tools

Wrench Works on Rack and Pinion. Because it is only ⅜" thick, this rack-and-pinion wrench can deliver extreme pressure in hard-to-get-at spots. Over-all length is 5¼". The jaw opening can be adjusted from zero to slightly over ⅜". The Colman Tool & Machine Co., of Amarillo, Texas, claims the wrench is unbreakable. It is priced at about $1.50.



Pocket-Size Tacker for Wire. Front and rear guides of this stapler circle the wire, making it easy to draw the tool around corners. The staples penetrate plaster, composition board, and wood with as much as 64-lb. holding power. The Heller Company, of Cleveland, is the maker.

Wrenches Fit Inside Pipes. When one of these tools is inserted in a pipe and turned with a conventional wrench fitting the hexagonal section, the knurled eccentric grips the inside of the pipe. Made by the Roddick Tool Company, of Anaheim, Calif., they can be used without marring the pipe exterior. They come in 12 sizes from ⅛″ to 4″ and are priced from $1.98 to $32.50.

Restores Threads in Tight Spots. Because this thread restorer has a swing of only 2 5/16″, it can be used in close quarters—on cylinder-head and wheel-lug studs, for example. The jaws are engaged at the bottom of the thread and turned outward. This model weighs 1¼ lb., and handles standard threads from ¼″ to 1″ root diameter, either right or left hand. Other models take up to 4″ diameter. Buckingham Mfg. Co., Binghamton, N. Y., is the maker.

AT LAST . . .
THE SANDER YOU HAVE Been *WAITING For!*

with 100% MORE Power!

You'll jump with joy when you grab this new SYNCRO SANDER—when you see how its 100% MORE POWERFUL Stroke—sands TWICE as efficiently! Remember, too, SYNCRO alone has the famous DOUBLE ARC MOTION that sands, polishes BETTER by actual comparison! Every workshop and home needs this amazing, 100% MORE POWERFUL SYNCRO! Also perfectly wonderful for relaxing tired muscles with its powerful Double Arc Motion! Complete with BUILT-IN Fractional Horsepower Reactance Electric Motor, 10 sandpapers, polishing-massaging pads, cord. Only..... **$19.95**

NEW JIG SAW 70% MORE POWERFUL—QUIET!

Cuts any length 1″ wood, thin metal, plastics yet SAFE for children! Thousands used in schools, homes, etc . . . QUIET . . . Portable . . . Use even in apartments . . . . . Stroke adjustable . . . UL-Approved . . . Complete with Built-in Motor, blades, cord, **$22.95**

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SYNCRO CORPORATION
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P.S. Last minute news & notes...

A UNIVERSAL FUEL, something that can be used in jeeps, tanks, jet planes, or what have you, is being sought by the U.S. armed forces. It would simplify supply problems, but "mechanical octanes" would have to be built into all types of engines to accommodate it. Contracts for experimental work on such engines are being let, but the outlook thus far is not encouraging.

AUTO MAKERS report that, despite the fanfare about the automatic transmissions, 200,000 more cars with overdrives (PS, April '49, p. 180) were sold in 1950 than in '49, and production of these units has continued at a fast pace this year.

VETERANS who want to go to school or take correspondence-school training should do so pronto. In most cases, the Veterans Administration reports, they will lose their educational benefits if they have not started their courses by July 25, 1951.

X-RAY PICTURES now can be developed without a darkroom and examined by a doctor 45 seconds after they are taken. It is done with a new self-developing film (PS, Jan. '51, p. 138) devised by the Polaroid Corporation. The armed forces will get it soon, and it is scheduled to be available for civilian use by the end of this year.

ELECTRIC SHAVERS, garage-door openers, and other such aids to modern living may be shelved in the next war. They send out electromagnetic radiations that the Defense Department says the enemy might use as homing signals to guide his bombers and missiles.

HOW MUCH LIQUOR an unconscious man has had now can be determined. It's done with an electrical instrument, devised at Yale, called an Alcometer. It will help distinguish between drunkenness and illnesses that sometimes make a man act as though he were drunk when he isn't.

THE BEAVER, the high-wing monoplane built in Canada especially for bush pilots (PS, Nov. '49, p. 154), will be used by the U.S. Air Force. It won out over eight U.S. planes in recent liaison aircraft evaluation tests at the Wright-Patterson Air Force Base near Dayton.

A HIGH WIND high in the atmosphere, known as the jet stream, has been shown to be partly responsible for the weather down where we live--because it affects the pattern of lower-air movements. Canada and Sweden now are using data regarding it in their weather forecasts, and the U.S. Weather Bureau is including it among the factors on which it bases five-day forecasts.

AN ATOMIC SUBMARINE would be "a wolf that could go after its prey" rather than "a spider that must wait quietly for its victim to approach," the authorities say. Building the first one is expected to cost $40,000,000, which is about four times the cost of a fleet-type submarine now.

A ROAD REBUILDER to reduce the need for detours has been developed in California. It uses old material in paving that is to be replaced. The asphalt is softened with a light oil, new material is added, and the road is instantly repaved as the rejuvenator moves down the highway.

IF YOU TUMBLE into icy water, don't try to save your strength by simply hanging onto something until help comes. Medical researchers say your chances of surviving will be better if you swim or struggle as much as you can as long as you can.

The Editors

This One
SF7F-7XT-X31F

ELECTRICITY LEAPS from storm clouds to top of Empire State Building as shown in this dramatic night photograph. Engineers harness electrical energy like this to "fire" gasoline in your engine.

Scientists Create "TAILORED LIGHTNING" For Better Motoring

In the great engineering laboratories of The Electric Auto-Lite Company in Toledo, Ohio, a group of Auto-Lite Ignition Engineers have been probing inside engine cylinder walls, peering at "blow-by-blow" spark performances, charting the behavior characteristics of man-made "lightning" across the spark plug gap. From endless tests they've determined what your engine's ignition system needs most, and then set about producing spark plugs to fill the bill. Net result: Ignition Engineered Auto-Lite Spark Plugs . . . the spark plugs that are *world famous* for quality and performance.

FRANKLIN'S KITE experiment was first demonstration of electrical nature of spark discharges between clouds. Date: 1752.

"FIRING PIN" of the car engine. Your spark plugs fire as many as 15,000 fuel charges per minute with tailored precision.

RELIABLE STARTING is one important benefit resulting from Auto-Lite research to assure correct materials, dimensions and design.

RIVER CUTTING CANYON resembles way surging of electricity wears away electrodes. For solution see next picture.

TINY UNIT called a "Resistor" permits wider initial gap setting, makes possible these advantages of Resistor Spark Plugs:

All car, truck and tractor owners benefit from the exhaustive research performed by Auto-Lite Ignition Engineers . . . the men who design the coil, distributor, spark plugs, wire and all the other parts of the complete ignition system used as original factory equipment on many leading makes of America's finest cars and trucks. *You're Always Right With Auto-Lite.*

THE ELECTRIC AUTO-LITE COMPANY
Toledo 1, Ohio **Toronto, Ontario**

*Double life under equal service conditions when compared to spark plugs without a built-in resistor.

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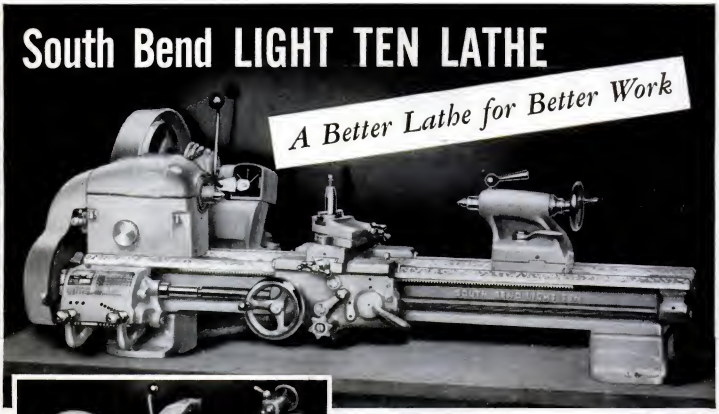
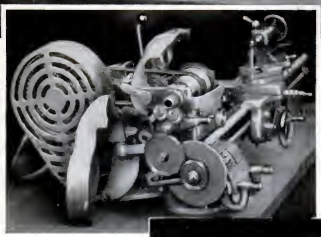
SPARK PLUGS

South Bend LIGHT TEN LATHE

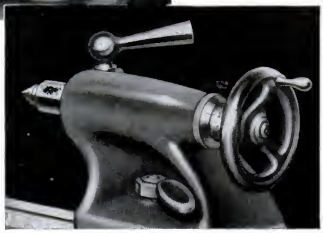
A Better Lathe for Better Work



Light Ten Model A Lathe — 10" x 3-1/2'



For safety, all gears and pulleys are enclosed, yet they are easily accessible.



Tailstock has 1/10" graduations on spindle and micrometer collar on screw.

This new Light Ten Bench Lathe is the result of forty-three years of experience in designing and building fine lathes. It is a modern precision tool having the most recently developed improvements, plus features usually restricted to larger lathes. In this lathe you get big lathe features at small lathe prices. We consider it one of the best values ever offered. The quick change gear box and universal power feed apron provide a full range of 48 screw threads, 48 power longitudinal feeds and 48 power cross feeds. Large, precision-bored bearings for the superfinished spindle insure extreme accuracy and service. The tailstock has graduated spindle and micrometer collar screw.

SOUTH BEND

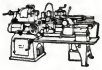
Building Better Tools Since 1906 • SOUTH BEND LATHE • South Bend 22, Ind.

Send Information Checked:

- ☐ Light Ten Lathes
- ☐ Lathe Attachments
- ☐ New "How to Run A Lathe" book, (Enclose 25c coin or stamps)

☐ 9" and 10" Bench Lathes

☐ 10" to 16-24" Floor Lathes



☐ 1/2" & 1" Collet Turret Lathes

☐ 14" Drill Presses

☐ 7" Bench Shapers

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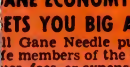
The GANE-O-MATIC Overdrive Control



A 20% discount is offered all Gane Economy Club Members on this revolutionary new automotive item. It gives all cars with overdrive the following benefits: An Automatic Hill-older; The Use of Six Forward Speeds; No Clutch hifting In All Gears; Motor Compression When In verdrive. WRITE FOR YOUR FREE TRIAL GANE EEDLE AND WE WILL ENCLOSE FREE, ILLUS-RATED GANE-O-MATIC LITERATURE.

BURN WATER IN YOUR CAR!

he OCTAGANE "50"

Economy Club Members receive automatic 20% discount privileges on the famous Octa-Gane "50", the only all bronze, exhaust pressure operated water-alcohol injector on the mar-ket today. U. S. DEPARTMENT OF AGRICULTURE SCIENTISTS SAY, "New high compression auto-mobile engines can increase gasoline mileage up to 0% with alcohol-water-gasoline fuels." WRITE TODAY FOR YOUR FREE TRIAL GANE NEEDLE AND FREE, INFORMATIVE INFORMATION ON THE OCTA-GANE "50".

MANY GANE NEEDLE USERS REPORT FASTER PICK-UP, EASIER STARTING A

...but don't take our word for it...see for yourself! Test a Gane Needle in your car for 10 days at our expense. Then compare your mileage and performance. If fully satisfied, send us only $1.50 per needle (8 cylinder cars take two). If not satisfied, just return the needle and you owe nothing...fair enough? Since authorities differ on the merits of Ganes and some users report no improvement, TRY BEFORE YOU BUY!

SEND NO MONEY! PAY POSTMAN NOTHING!

Just fill out the required information on your car in the space provided in the postage paid postcard and mail it today. Your FREE TRIAL GANES will be sent immediately.

WHAT MANY "WHO SHOULD KNOW" SAY ABOUT GANE NEEDLES!

CARBURETOR ENGINEERING CO.: "Tests used 3.6 gallons LESS with Gane Air-Flow Needles...a saving of 72c in ONE DAY." Otto H. Dahike, Ferguson Carburetor Engineering Co. **YELLOW CAB CO.:** "Mileage check on 4 cabs showed 10.1 miles per gallon without...12.5 miles per gallon with Gane Needles. Supply our entire fleet at once! Yellow Cab Company, Evansville 2, Ind. **TRUCK OWNER:** "The saving after needle was installed averaged $1.00 per day." Joe D., Bellaire, Ohio. **POLICE:** "I'm equipping all the patrol cars of our police department, please rush order." **NEWSPAPER:** "The Gane Needle gives you from 2 to 4 extra miles a gallon." Tony Weitzel, Detroit Free Press.

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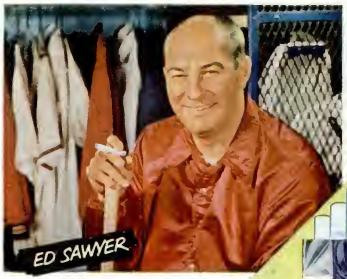
This automotive economy manual is sent Free to all who try Gane Needles. It tells how to save gas, brakes and tires; how to gain more speed, power and better performance from any car. Written so you can understand and follow its simple, illustrated instructions, it is yours to keep whether you purchase Ganes or not. It also introduces many new and unusual automotive economy products.

"GET 150 MILES PER GALLON WITH YOUR CAR"—This new book by Ernest Newhouse tells how full sized passenger cars actually get over 100 miles on a gallon of regular gas. Mr. Newhouse is a recognized authority in the "sport car" field and his books and manuals are purchased annually by thousands of economy minded American motorists.

"Get 150 Miles Per Gallon" and "Economy In Driving" will both be sent absolutely free to all who write for Free Trial Gane Needles. Write Today... Our Supply is Limited!

With Baseball's Big Winners... it's COOL, MILD CAMELS!



"Manager of the Year" in 1950, Ed masterminded the Phils into the pennant. "My own 30-Day Camel Mildness Test proved how mild a cigarette can be!"

Most Valuable Player of 1950 in National League, Jim Konstanty says: "Camels give me the kind of flavor and mildness I find in no other brand."

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Leading Right Hand Pitcher of 1950, Cleveland's Bob Lemon, only hurler to win 20 games or more in each of the past 3 years, says: "I'm glad I made my own 30-Day Test. Camels hit the spot!"

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